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MAN BEFORE METALS

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WITH ONE HUNDRED AND FORTY-EIGHT ILLUSTRATIONS

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MAN BEFORE METALS.

INTRODUCTION.

THE only trustworthy annals of primitive humanity are written in the Book of Nature; to it, therefore, we should have recourse. Unfortunately many leaves have disappeared, or have been effaced from this great book, written by the hand of God, and those which remain are for the most part hard to interpret. Hence, in spite of the precept of ancient philosophers (*γνῶθι σεαυτὸν*), that which man knows least well is himself. For in fact neither his body, his affections, nor his mind, nor the vital principle which animates him, are entirely known to him; he is ignorant of his origin, his cradle, his history.

But on the other hand, man has measured the heavens, and calculated the weight of the earth and the distance of the stars. He has converted Jove, the Thunderer of old, into a mere messenger, who instantaneously transmits the thought, and even the voice of man from one end of the world to the other. He is able, moreover, by another unlooked for wonder, to recall the voice of the dead. He has taught golden-haired Phœbus and pale Diana to paint their image, his own, or that of anything he wishes, on the lens of a camera-obscura, and has even reduced them to the humble *rôle* of copyists of our ancient manuscripts. He has dethroned Neptune, and laughs at his terrors. He can outstrip the bird on the wing, and

machines made by him can travel without fatigue ten times as fast as the swiftest horse.

Man has conquered the elements; the winds obey him as his slaves, and soon, perhaps, ships of a new kind will cut their way through the regions of the air as safely as vessels now traverse the vast extent of the ocean. Fire has become a liquid in his hands.[1] The earth, subjected to an universal analysis, reveals her secrets one by one. In short his genius daily invents wonders, which, surprising as they are, now appear so natural that the bare mention here made of them may appear common-place to the reader.

Man, I repeat, knows not his own nature nor his own history. Yet nothing of greater moment could be presented as the object of his study, of his active curiosity, and of his eager desire to learn the origin and nature of things.

Wrapped in a thick veil, buried in the remote past, the first records of the human race have long been concealed from the eyes of seekers, who did not even suspect their existence, or at any rate their deep significance. The rare concurrence of fortunate circumstances, the wisdom, ingenuity, and courageous perseverance of a man imbued at once with courage and the true scientific spirit, have been necessary to the complete interpretation of the mysterious language of these splintered stones, of these bones dug out of the bowels of the earth and given back to the light of day after so many thousands of years, perhaps of centuries! Archæology, greeted at first with ironical sneers or the contempt of incredulity, has by an inevitable reaction given rise to extravagant enthusiasm, and to ill-considered systems, which have more than once injured its cause and obstructed its real progress. With equal disregard for over-eager enthusiasts and systematic detractors, we must concern ourselves solely with the results obtained. Beyond all question the most important, the most unex-

[1] Under the well-chosen name of *liquid fire*, the learned and laborious Nicklés has defined a substance of which the important discovery cost him his life. May I be allowed to lay the tribute of my affectionate and sincere sorrow on the grave, which closed so prematurely over this savant, who was as honourable as he was learned?

pected, and at the same time one of the most assured of these results, is the establishment of the great antiquity of prehistoric man.

The name itself indicates that history, as it has been hitherto understood and taught, is unable to give us any precise information concerning this antiquity.

Neither the tables of Manetho, nor the Bible itself, can help us here. Many learned men and theologians admit that their chronology is uncertain, full of gaps, and corrupted by copyists and commentators. Sylvestre de Sacy, a Christian of undoubted orthodoxy admitted that there was no Bible chronology. One of our most learned ecclesiastics has owned, with a sincerity which does him credit, that 'the chronology of the Old Testament has never been accepted by the Church.' He declared it to be the result of the combination of certain dates, of the interpretation of certain passages, which concern neither faith nor morals, and which may be corrupt; it is even certain that there are breaks; and the cosmogonies of the different authorised versions do not agree with each other, &c. &c. 'Nothing therefore,' continues the learned theologian, 'need prevent the addition of a greater or less number of years to the generally accepted figure touching the first appearance of man on the earth, if science were able to fix the date with certainty. But this certain result is far from being attained.'[1] On this last point we entirely agree with the learned Abbé Duilhé de Saint-Projet. But the concession which he makes regarding the uncertainty of Bible chronology is in our eyes far more important than his own, since it shelters us from the reproach of impiety so often cast upon unoffending science by those who know nothing of her spirit and misconceive her aims. Moreover, science replies by facts, and often by benefits, to those conclusions, rashly formed *à priori*, by which some men attempt to annul her discoveries, to accusations as unjust

[1] See the *Semaine catholique de Toulouse*, March 28, 1869, and especially the *Minerve de Toulouse*, in which the *Conférences* of M. l'Abbé Duilhé de Saint-Projet are reviewed in a spirit of impartiality which does credit both to the able critic and the learned theologian.

as they are malicious, which are too often and too lightly brought against her. Some of the following facts, revealed by learned men, confirm in all essentials the statements of the purest orthodoxy.

'No date,' says the eminent palæontologist, M. Ed. Lartet, 'is to be found in Genesis which assigns a time for the birth of primitive humanity; but chronologists have for fifteen centuries endeavoured to force the Bible facts into agreement with their systems. Thus, no less than one hundred and forty different opinions have been formed about the single date of the Creation, and between the extreme variations there is a discrepancy of 3,194 years in the reckoning of the period between the beginning of the world and the birth of Christ. The chief disagreement is with respect to the interval of time nearest to the Creation. From the moment therefore that it becomes a recognised fact that the question of human origin owes no allegiance to dogma, it will become, as it ought to become, a scientific thesis open to discussion, to be considered from every point of view, and capable of receiving that solution which tallies best with fact and with experimental proof.[1]

Such is our own scientific profession of faith upon this delicate question. It would have been far better to move onward with Galileo than to force an unworthy recantation from him, especially as we have seen in our own day one of the most famous of his countrymen, Father Secchi, Director of the Roman Observatory, and Corresponding Member of the French Institute, proclaim the superiority of the philosophy of this same Galileo, once condemned and imprisoned by the Inquisition. 'Let science take her course,' we repeat with M. Duruy, 'let her do her work; the soul is at the end of it.'[2]

We pass on to the consideration of the means by which the new science of archæology is enabled to establish, not

[1] Ed. Lartet, *Nouvelles recherches sur la coexistence de l'homme et des grands mammifères fossiles, réputés caractéristiques de la dernière période géologique* (*Annales des Sciences Naturelles*, 4e Série, t. xv. p. 256.)

[2] V. Duruy, *Discours au Sénat.*

the precise date of the appearance of man on the earth, since this result has not been and perhaps will never be attained, but to determine an approximate date which is certainly prior to that indicated by any cosmogony.

Flints are found scattered over the surface of the soil, or buried in its depths; in the heart of gloomy caves, or beneath the ruins of the most ancient monuments; some rudely shaped, others finely polished and fashioned into forms similar to those of our axes, knives, and tools of every kind.

These flints had been observed by the ancients, who gave them the names of *lapides fulminis*, *ceraunicæ gemmæ*, &c., and in later times they were called *lightning stones*, *thunderbolts*, *stones fallen from heaven*. They were employed in certain sacred rites by the Egyptians, the Romans, and perhaps also by the Scandinavians, the worshippers of Odin and Thor.

Even in our day, in the nineteenth century, so slow is progress in any direction, these stones, said to be fallen from heaven, are the object of superstitious veneration in remote country districts, and they may not unfrequently be found in the cottages or cowsheds of peasants, who firmly believe that they can thereby preserve their dwellings from lightning, themselves from witchcraft, and their cattle from disease.

But what are these strange stones, which, since they have attracted the notice of antiquaries, have been found in almost every part of the world: at Paris and at the Cape of Good Hope, at Toulouse and Christiania; in the diluvium of the valleys of the Somme and of the Thames, and in the ossiferous clay of the caves of Languedoc and Périgord; in the dolmens of Brittany, of Algeria, and of Palestine; beneath the ruins of Nineveh and Babylon; in the Malay peninsula and in Japan; and even on the banks of the Ohio and the Mississippi?

This question was difficult to answer. According to some, these splintered flints were 'freaks of nature,' others held that they were of volcanic origin; others again, that they were stones split off by winter frosts. Some sagacious

men maintained that they were gun-flints, and moreover of recent fabrication.

A learned antiquary of Abbeville, struck by the singular form of some of these flints, which abound in Picardy, collected a great number of them, and examined and compared them with anxious and loving study. 'Were it only a question of pin-making, this is the price of success,' are the words of some philosopher. Unfortunately, the heated imagination of the antiquary, unconsciously influenced by a deceitful illusion, discovered on these flints the figures of men, of animals, of plants, carved with a definite intention, and even graphic signs, true hieroglyphs. Here he was mistaken: but while the dream of the archæologist soon vanished, the reality remained.

These flints were, indeed, works of art, a rude and primitive art it must be confessed; but as real and full of meaning in its simple expression as the Venus of Melos or the friezes of the Parthenon. They were evidently man's handiwork; he had shaped these flints, had given them definite forms, and had made them into weapons or tools.

And as these instruments of war, of the chase, or of handicraft were found buried at great depths, along with bones of extinct species, in strata undisturbed since their original formation, the logical, necessary, irrefutable conclusion is that

Dieu est éternel, mais l'homme est bien vieux.

Old in truth, for he was the contemporary of the mammoth or woolly elephant, of the *Rhinoceros tichorhinus*, of the unwieldy hippopotamus, the bear, and the great cat of the caverns, of the Irish elk, and of other animals of extinct species, of which our natural history museums possess complete and magnificent specimens.

But M. Boucher de Perthes underwent infinite trouble, annoyance, I had almost said humiliation, before he obtained the recognition of this conclusion, upon which all the others really depended. Etienne Geoffroy Saint-Hilaire has said, and he speaks with authority, 'the

crown of the innovator is a crown of thorns.' The famous antiquary wreathed his brows with such a crown, which wounded him more than once.

The idea was suggested, however, and since it was true, nothing could prevent its ultimate triumph, which is now complete.

More than twenty years elapsed before the discovery of M. Boucher de Perthes was allowed to come before the areopagus of the Institute. It is said that Cuvier refused to accept it; and this may easily be believed of a savant who had laid down the principle that man, the last born of creation, could never have been contemporary with those lost species whose remains lie buried in the most ancient quaternary beds. MM. Brongniart, Flourens, and Dumas, to their praise be it spoken, were the first to encourage the researches of Boucher de Perthes, and to show themselves open to conviction. The cautious and the timid, those who feared to be involved in some heresy or imposture, held aloof, and maintained that, even admitting the flints of Abbeville and of Saint-Acheul to be of human workmanship, their great antiquity would still remain a matter for dispute, so long as the precise age of the beds in which they were discovered was undetermined, so long as the virgin condition of these beds was unproven, and lastly, until not only the bones of extinct species, but also those of the human race, should be found buried with these stone tools.

These will certainly be found, was the confident reply of the courageous author of the book on Antediluvian Antiquities, and it was not long before the event justified his prophetic words. Many such discoveries have been made, and at the present day nothing seems more surely proved than the great antiquity of the human race. However, some belated or cautious minds are still in doubt, and it is precisely those whom we seek to convince. In order to accomplish this end, modern science has neglected no means of information, has left no ground unexplored. Cyclopean monuments, cities buried under layers of five or six forests, the frozen soil of Siberia and Greenland, the

tumuli of Ohio and Scandinavia, burial caves, dolmens, and menhirs, the lake dwellings of Switzerland and Italy, the nuraghi of Sardinia, the lava and volcanoes of Auvergne, the diluvium of plains and valleys, bone caves and fossil beds, have all been investigated by the science of our day, even to the rubbish heaps formed by the refuse of the primitive kitchens of the Scandinavians, known to Danish archæologists as '*kjökkenmöddinger*,' and in England as 'kitchen middens.'

Our aim in publishing this book has been to bring before the reader the numerous proofs hitherto collected of the great age of the human race, together with the details which confirm them. This forms the subject of the first part. In the second, we shall treat of the customs, the industry, the moral and religious ideas of man, such as he was before the use of metals was known to him, and we shall endeavour to trace his portrait with fidelity.

PART I.

THE ANTIQUITY OF THE HUMAN RACE.

CHAPTER I.

THE PREHISTORIC AGES.

I. GENERAL NOTIONS OF THE STRUCTURE OF THE EARTH.

It seems necessary, for the better understanding of the following chapters, to give to those of our readers who are unfamiliar with geological terms, a general idea of the various stages through which our globe has passed before arriving at the condition which it now presents to our view.

The immense majority of geologists hold that the earth was originally a mass of incandescent and fluid matter. As it gradually cooled an outer crust was formed, and the vapours dispersed in the atmosphere were condensed upon the surface of the globe, and formed the seas. At the bottom of these original seas the primary rocks and those of the transition period were deposited. These were followed by those of the tertiary period, which Lyell has divided into eocene, meiocene, and pleiocene;[1]

[1] The beds of the tertiary period have been thus divided by Lyell according to the number of recent shells contained in them as compared to the fossil ones. The lowest layer, the eocene beds (ἕως, dawn, and καινός, recent), that is, the most ancient deposit of the tertiary epoch, contains only 3½ species per cent. similar to those which now exist. The meiocene, or middle layer (μεῖον, less, and καινός, recent) is that in which the recent shells, less numerous than in the pleiocene, are in the proportion of 17 or 20 per cent. as compared to the extinct species. The proportion increases to 40 or 50 per cent. in the upper layer, the pleiocene beds (πλεῖον, more, and καινός, recent). An important remark

lastly the beds of the quaternary epoch, improperly styled diluvian.[1]

The oldest rocks, those which were formed by the action of fire, and which have therefore received the name of *plutonic*, are not stratified, that is, disposed in layers, and contain no organic remains. The sedimentary or aqueous rocks contain, on the other hand, numerous remains of vital organisms, belonging to creatures more or less complex, and bearing more or less resemblance to the plants and animals of the present day as they are nearer to or farther removed from our own time.

The geologist is thus enabled to determine the relative age of a given rock by means of the fossil species of which it bears the impression or retains the *débris*, just as an antiquary can judge of the age of a monument by the coin he has found beneath its ruins.

But we cannot enter into the history, full of interest as it is, of the successive phases of life on the surface of the earth; suffice it to say that birds[2] and mammalia are rare in the beds of the secondary epoch, at least in Europe, and are first found in great abundance in the tertiary formations; that certain marsupials and pachydermata now completely extinct (*pterodon*, *palæotherium*, *acerothe-*

has been made by Mr. Marsh, namely that the three layers of beds of the tertiary epoch, as they exist in America, 'are not the exact equivalents of the eocene, meiocene, and pleiocene of Europe, although usually so considered and known by the same names; but, in general, the fauna of each appears to be older than that of its corresponding representative in the other hemisphere; an important fact not hitherto recognised.' (Marsh, *Introduction and Succession of Vertebrate Life in America*, p. 24. An address delivered before the American Association for the Advancement of Science at Nashville, Tenn., August 30, 1877.)

[1] The words *dilunium*, *diluvian* strata, since they sometimes convey the impression that the biblical deluge created these beds, should be abandoned along with the error which has given rise to these misleading terms. The names of rocks of the fourth epoch, or post-pleiocene, have rightly been substituted for the latter, as more in harmony with the facts of geological chronology. The beds known under these names are far anterior to the historical deluge of Noah or of Deucalion.

[2] Birds are already numerous in the secondary rocks in America. It was in the chalk beds of the Kansas that Marsh discovered the remarkable *odontornithes*, or toothed birds, which seem to establish one link between birds and reptiles, as the pterosaurians without teeth (genus *pteranodelon*) form the passage from reptiles to birds.

rium, &c. &c.), are the first to appear; that these are succeeded by other often colossal and extinct forms, such as the *megatherium*, the *dinotherium*, the *macrotherium*, the *mastodon*, and even monkeys (*dryopithecus*); finally, that later on, and in the uppermost or pleiocene beds, elephants, oxen, horses, carnivorous and quadrumanous animals begin to appear, which show much analogy with extant genera and species.

As Professor Albert Gaudry justly observes: 'The pachyderms flourished on the earth during the earlier half of the tertiary period, and only isolated examples of them are to be seen at the present day; the ruminants on the other hand lived during the second half of the tertiary period, and their order is still extremely numerous in our own time.'[1] The quaternary or diluvian beds follow the pleiocene, and their latest formations may be considered as belonging to the present epoch. We will therefore devote a few moments to the study of these beds, which are the more important to us, since they alone, as far as we yet know, are almost incontestably proved to contain the most ancient traces of the existence of man upon the earth.

QUATERNARY OR DILUVIAN ROCKS.

The diluvium of geologists.—The quaternary beds, also called diluvian, pleistocene, or still better, post-pleiocene, are composed of a series of layers or depositions of very various nature (marine, fluviatile, torrential, or glacial), formed between the end of the pleiocene period and the dawn of history. Sometimes stratified, sometimes mixed or incoherent, they contain the remains of numerous mammals, some of which of colossal size have slowly and gradually become extinct, while others, usually smaller, have survived to our own day.

The stratified deposits of which these beds are partly composed are very similar to those of the tertiary period.

[1] Albert Gaudry, *Les enchaînements du monde animal dans les temps géologiques*, p. 77, Paris, 1878

The great marine formation of the coasts of Sicily, the pampas of South America, the sands of Sahara, the steppes of Eastern Russia, the travertine of Tuscany, are well-known examples of quaternary deposits. But in addition to these, other much less regular deposits have been formed under circumstances very characteristic of the epoch in question.

These characteristic phenomena are as follows :—

(1) Erratic deposits of the Alps, and of the north of Europe.

(2) Diluvium of the valleys.

(3) Filling of the caves and osseous breccia.

(4) Certain appearance of man upon the earth.

Glacial Period. Erratic Phenomena. — It seems proved beyond a doubt that towards the close of the tertiary, or at the beginning of the quaternary epoch, the temperature of the northern hemisphere was sensibly lowered. As the atmosphere became moister and colder, the watery vapour was condensed, and frequent falls of snow, in the form of *névé*, covered the mountains, plains, and valleys of northern and central Europe with glaciers. This is known as the glacial period.[1] The Alpine traveller

[1] This term is perhaps incorrect, as it leads to the belief that there was but one glacial period. Many geologists, however, and notably M. Ch. Martins, reckon two glacial epochs, the first belonging to the older pleiocene period, the second to the more recent, that is, towards the beginning of the quaternary epoch. Certain geologists go so far as to maintain, that these glacial phenomena recurred periodically from the time of the most ancient fossiliferous strata down to that of the diluvian rocks properly so called. M. Julien, who has specially devoted himself to the study of glaciers, also admits two glacial epochs; the one beginning after the development of the mastodon, which became extinct in Europe at the end of the tertiary period, while it continued to live in America throughout quaternary times. This first glacial epoch was followed by the diluvian period, a consequence of the melting of these first glaciers, to which magnificent phenomenon the formation of valleys, the erosion of the soil, the transport of boulders, &c., must also be attributed. The glacial phenomena were repeated at the epoch of the *Elephas primigenius*, and have left their traces in the Vosges, the Alps, and the Pyrenees, as the first had done in Switzerland and in northern Europe. The inter-glacial epoch, that is, the intervening period, is represented by the submerged forest of Cromer, the leaf-impressed coal of Dürnten and of Utznach (canton of Zurich), the deposits of the Val d' Arno, &c. M Julien considers the Alpine diluvium to be a re-formation of the sedi-

is surprised to see blocks of granite or porphyry lying on the eastern flank of the Jura, or dispersed in the Swiss valleys; they are often of enormous size, and their mineralogic constituents differ completely from that of the calcareous beds or jurassic marl upon which they lie. Striated, grooved, and polished surfaces may be observed on these detached blocks, and upon the undisturbed rocks which shut in on either side the Alpine valleys.

The transport of these colossal masses of rock to the heights where they may now be seen, and the scratching, grooving, and partial polish which may be observed upon them, are now generally admitted to be the work of extinct glaciers, which in their slow progress, and by means of the stones imbedded in their mass, have polished, and as it were, engraved the rocks with which their movement brought them in contact. The erratic blocks lying upon peaks often very far from their original site were also brought thither by the glaciers of that period.

At some definite period a rise in the temperature of the surrounding atmosphere brought about the melting of the ice, and as a natural consequence all the foreign bodies which were borne along by the glacier were deposited on the sides of the mountains or in the valleys. The action of the floods, caused by the melting of the same ice, sufficiently explains also the presence of glacial mud, the fragments of rock, the gravel and waterworn pebbles which are to be found at the foot of the Alps, and in the neighbouring valleys (moraines).

The erratic phenomena in the north, more complex and more extensive than those of the Alps, are evidently due to analogous causes. In this case the floating ice from the arctic regions transported immense blocks, of which the mineralogic constituents sufficiently prove their foreign

ment of the first period, to which he also attributes the upper grey and red diluvium, and the lower grey diluvium, or diluvium of the plains. He attributes to the second period the diluvium of the Vosges, and he connects the *loess* with the melting of the glaciers of the Rhine which belong to this period, and which still subsisted when those of the Vosges had completely disappeared. (*Matériaux pour servir à l'histoire primitive et naturelle de l'homme*, t. v. p. 374.)

origin, to a great distance from the place of their formation. These blocks, known in Germany under the name of *Fündlinge* (foundlings), are scattered abundantly over the plains of Russia, Poland, Prussia, and even of England. Nearly similar phenomena took place in North America.

Deposits of sand, gravel, and sea shells, known under the name of *drift*, are to be found in the neighbourhood of these blocks, which are for the most part angular. Everything seems to prove that these deposits, which extend over a great part of Northern Europe, starting from the Scandinavian peninsula, were formed at the bottom of the sea, by which, during or immediately after the first glacial epoch, the greater part of North America, the British Isles, and Scandinavia was covered.

Diluvium of the Valleys.—The ordinary erratic phenomena, we are told by M. Leymerie, took place principally among mountains and in their immediate neighbourhood, and the glaciers were the principal agents, or at least took a direct part in their production. The various phenomena which are known collectively as *diluvium*, are on the contrary chiefly to be observed in the plains, and they owe their existence to river-floods. Two distinct and contrary effects are produced by these phenomena—the formation of those valleys known as valleys of erosion, and the partial filling of these same valleys by the diluvian waters bearing along in their current the *débris* from the mountains (gravel, waterworn pebbles, sediment of mud and sand, usually impregnated with oxide of iron or calcareous matter), which they deposit upon the plain. The two sorts of diluvium are generally distinguished as the grey and the red diluvium, the latter more recent than the former. Lastly, an important deposit of an homogeneous greyish-yellow sediment, known in Alsace under the name of *lehm* (loam) and on the other side of the Rhine as *loess*, covers the stony deposit which constitutes the true diluvium to a depth of sixty or eighty yards.

M. Favre has established between the diluvian beds of the north-west of France, and those of the valley of the Rhine, a parallel which it may be useful to reproduce

here. If, as we have no reason to doubt, this parallel be exact, it follows that the remains of human industry found in the valleys of the Somme, of the Seine, and of the Marne, correspond to the lower diluvium of the Rhine valley, a deposit far more ancient than the glaciers of the Vosges, since it is separated from the latter by the mean diluvium of the Rhine, or red diluvium of the Seine valley.[1]

QUATERNARY BEDS.

In the North-west of France.	*In the Rhine Valley.*
UPPER DEPOSIT.—*Lehm* or *loess.*	*Lehm* or *loess* in the plain, moraines in the mountains.
MEAN DEPOSIT.—Sand and gravel, known as *red diluvium* (valleys of the Somme, Seine and Marne).	Gravel composed of materials not transported from a distance: an earlier deposit than the ancient glaciers.
LOWER DEPOSIT.—Gravel transported from a distance, containing flints of human workmanship, and fossil remains of *Elephas primigenius*, rhinoceros, stag, horse, ox, &c.	Gravel, pebbles, composed exclusively of rocks of Alpine origin, of earlier date than the glaciers.

The diluvian, or quaternary, epoch, is further characterised, as we have before remarked, by the deposits in the caves, by the formation of osseous breccia,[2] and by the certain appearance of man upon the earth. The circumstantial details into which we shall shortly enter allow and even constrain us to confine ourselves for the moment to these general outlines. With the exception of a few species, extinct or migrated,[3] the quaternary fauna and flora offer the most striking analogies, or more strictly speaking, the most complete identity, with the fauna and flora of the present day.

[1] A. Favre, *Sur l'existence de l'homme sur la terre antérieurement à l'apparition des anciens glaciers.* (*Bibliothèque universelle de Genève; Archives*, t. viii. p. 200, 1860.)

[2] The osseous breccia are heaps composed of angular fragments of rock and various fossil bones, cemented together by calcareous or ferruginous mud. These osseous breccia occur in the bone caves, and in the numerous holes or fissures which abound on the coasts of the Mediterranean (Cette, Antibes, Nice, Gibraltar, &c.).

[3] The principal species of the quaternary beds which are extinct at the present day are the mammoth, the *Rhinoceros tichorhinus*, the great bear, the great cat, the cave hyena, and the Irish elk.

CHRONOLOGICAL TABLE OF THE PRINCIPAL ROCKS.

A.—Aqueous rocks formed at the bottom of seas, and stratified, or disposed in layers.

Modern Rocks		Lacustrine and fluviatile deposits. Sand hills
Quaternary or post-pleiocene rocks		Red diluvium, and upper *lehm* or loess Grey diluvium Rhine *loess* of glacial origin
Tertiary Rocks	Pleiocene	Sand pits of Saint-Prest
	Meiocene	Freshwater strata Sands of the Orleannais *Faluns* of Touraine Limestone of Beauce
	Eocene	Gypsum and marl of Paris and Aix Paris limestone beds London clay
Secondary Rocks	Cretaceous	Chalk of Champagne
	Jurassic	Lithographic limestone of Solenhofen
	Trias	Variegated marl, *muschelkalk*
Transition Rocks	Permian	Sandstone of the Vosges
	Carboniferous Devonian Silurian Cambrian	Coal fields, new and old red sandstone, schistose rocks of the Pyrenees

B.—Unstratified or Plutonic rocks.

Primary Rocks	Crystalline schists Gneiss, mica-schist Metamorphic limestone		
	Eruptive Rocks		
	Granite	Trachyte	Serpentine
	Protogine	Basalt	Diorite
	Porphyry	Lava	Ophite

II. THE MEANING OF THE WORD FOSSIL AS APPLIED TO MAN AND OTHER ORGANISED BEINGS.

The species of man whom we propose to study is commonly known as *fossil*[1] man, *primitive* man, *pre-*

[1] *Prehistoric* man is frequently but wrongly designated *fossil* man. This last epithet suggests the idea of an extinct species; applied to

historic man: he has even been sometimes called *man-monkey*, or *pithecanthrope*. The first of these denominations needs comment; the second rests upon a bold hypothesis, which needs proof. What then is a fossil being? The various definitions which this word has received necessarily bear the stamp of the opinions prevalent at the time when they were given.

Thus, when geologists explained all phenomena by tremendous cataclysms, when Alcide d'Orbigny supposed that the Sovereign Architect, filling the ungrateful *rôle* of Penelope, created and destroyed his still incomplete work twenty-seven times, the word fossil was understood to mean any organic remains naturally buried in the strata of the earth previous to the last catastrophe which overwhelmed it, that is, before the appearance of man upon its surface. Now, this first appearance, placed after the diluvian or post-pleiocene epoch, properly so called, apparently formed a natural boundary between geological ages and the present time. Every animal or vegetable species of which the remains were found buried in the diluvian, tertiary, or yet older strata, were reputed to be *fossil*, and therefore necessarily extinct. All species buried at a later date than the diluvian deposit were to be considered merely *humatile* or *sub-fossil*. The words *fossil* species were, therefore, synonymous with *extinct* species, as if any organised being might not be individually fossil, without the extinction of the entire species to which it belonged.

Thus the *urus* was only fossil in Cæsar's time; at the present day the whole species is fossil and extinct. But the aurochs, whose remains are found in the diluvian beds with those of the cave bear and of the mammoth, is at once fossil and living, since it is still to be found, in small numbers it is true, in the forests of Lithuania, where it continues to breed under the special protection of the Czar of Russia.

Moreover, a certain number of animals of which the

man it signifies merely that he has been contemporary with lost species, for his own still exists.

remains are found in strata of a later date than the first appearance of man, have become extinct at a time very near our own. No one will deny that these species are at once fossil and extinct. The dodo of the Isle of France, the dinornis of New Zealand, and the epyornis of Madagascar are cases in point. We therefore apply the word fossil to all species really extinct, even though its extinction was not prior to the present geological period, and took place under conditions similar to those now existing. For us every extinct species, such as mammoth or dodo, is fossil, although every fossil species is not necessarily extinct, such as reindeer and musk ox.

As it is essential in the discussion of every important subject to arrive at a distinct understanding as to the meaning of the terms employed, we assert that, in our opinion, the term fossil as applied to man does not represent the idea of extinction (for we hold that primitive man still exists in the person of his descendants), but that of synchronism with those great animals (mammoth, *Rhinoceros tichorhinus*, &c.) which, after leaving more or less numerous traces in the pleiocene rocks, have ended by becoming extinct at different ages of the quaternary epoch, and of which some few have survived even to our own day, as the reindeer, musk ox, &c.

Fossil man, as we understand the words, does not belong to the present geological age, to that which directly follows the quaternary epoch. His actions are not within the domain of history, since they are far earlier. The study of primitive man belongs to the province of palæontology, on the same grounds as that of his contemporaries, the great cave bear and the mammoth. The human species is *fossil* but not *extinct*.

III. PREHISTORIC AGES.

'It is with humanity as with the successive individuals of which it is composed; memory only begins at a somewhat advanced stage of the development of the race; it has no consciousness of earlier conditions. The first manifestations of essential activity have left no traces in the

memory of mankind.'[1] But, as is invariably the case, at the point where history ceases, fable begins.

Classical antiquity tells us of four successive ages—the ages of gold, silver, bronze, and iron. Under the reign of Saturn, that is during the golden age, men enjoyed a long life, which they spent in the midst of happiness, peace, and plenty. But the horrors of war were soon let loose among them; iron took the place of gold; a rapid decadence began, and man retains at the present day only faint traces of his primitive perfection and happiness. Another myth of later date, and more in harmony with the facts observed, tells us that the earth was originally inhabited by a race of giants, and by a subsequent creation of a race of dwarfs. The giants dwelt among the rocks, and built there walls of cyclopean masonry; they carried stone clubs, and were ignorant of the use of metals. The dwarfs, far weaker, but at the same time far more industrious than the giants, inaugurated the age of bronze. They sought this metal in the bowels of the earth, and with the help of fire forged precious ornaments and shining arms, which they gave to men. Finally, giants and dwarfs gave place to the men of the iron age, and were forced to abandon the land. It is curious to see poetry thus forestall history, and mention distinctly the series of epochs which are generally admitted by modern science. Lucretius has these lines in his poem, 'De natura rerum':—

> Arma antiqua, manus, ungues, dentesque fuerunt,
> Et lapides, et item sylvarum fragmina rami:
> Posterius ferri vis est, ærisque reperta,
> Sed prior æris erat, quam ferri cognitus usus.

The researches undertaken, and the discoveries given to the world in these days in Denmark, England, France, Switzerland, Italy, and, indeed, in almost every part of the world, show that the facts are very nearly in agreement with the fable.

Archæology combines with geology to show that human civilisation has passed through three more or less distinct stages, in Europe at least, for which the names of stone,

[1] Lamennais, *Esquisse d'une Philosophie*, t. iii. p. 42.

bronze, and iron ages have been retained, although they may be, perhaps, rather too suggestive of the myth. We ought, probably, to reckon that a copper age intervened between the stone and bronze ages, if not in Europe,[1] where it has left few traces, at least in certain districts of the New World. For instance, the mound builders, an ancient and long extinct race, whose earthworks excite the astonishment and admiration of the traveller in the valleys of the Ohio and Mississippi, wrought the native copper of Lake Superior with stone hammers and without the aid of fire, long before the day when the Mexicans and Peruvians cast bronze statues, weapons, and ornaments of every kind. It is certain that Europe, whose advanced intellectual culture is justly the object of our admiration, was first inhabited by tribes to whom the use of metals was entirely unknown. Flints more or less skilfully fashioned, and other very hard materials, such as serpentine, quartz, and diorite, bones, horn, and wood were the only tools used in the manufacture of their weapons and of the implements of their rude industry.

These tribes belonged, then, to the *stone age*, the first stage of civilisation. But it has been thought expedient to divide this age into two periods, according to the different degrees of perfection to which the workmanship of the implements had attained in each subdivision; the earlier of these two periods has received the name of archæolithic or palæolithic (the age of rough hewn stone),

[1] Several urns and instruments of pure copper have, however, been found in the British Isles, in Hungary, Savoy, Switzerland, and Spain, where, according to M. de Prad, the copper age preceded the bronze age. According to M. Rougemont, the Russian Tschoudes also had their age of pure copper. Lastly, implements both of pure copper and of bronze have been taken from Egyptian tombs which date from the time of Suphis, the builder of the great pyramid. We cannot hitherto decide with certainty whether or no a copper age existed in France or in America. But it is a fact that ornaments of red copper (necklace beads, rings, and bracelets) have lately been found in the burial caves of Saint Jean d'Alcas and of Durfort, and even in the dolmens of Aveyron (Cazalis de Fondouce, Cartailhac). In this there is nothing surprising, since copper is far easier to work than bronze: it is therefore natural that the former should have preceded the latter, especially in districts where copper in a pure state is more or less abundant.

the more recent that of neolithic (age of polished stone).[1] (See figs. 1, 2, and 3.)

The cave bear, the mammoth, the *Rhinoceros tichorhinus*, &c. belong to the first of these periods; they had become extinct in the neolithic period. At this last

FIG. 1, 2. CARVED FLINTS (DENMARK). SPECIMENS OF STONE IMPLEMENTS. (After Lubbock.)

FIG. 3. SPECIMEN OF POLISHED STONE (IRISH AXE).

[1] The archæo- or palæolithic age is anterior to, the neolithic age posterior to, the second glacial epoch.

epoch even the reindeer had disappeared from our lands and had migrated northwards, whither the musk ox (*Ovibos moschatus*) soon followed it. The age of polished stone is further characterised by the construction of the dolmens, the dawn of agriculture, and the complete domestication of several animals, which have since become the faithful companions or the useful servants of man.

The neolithic age was succeeded by that of bronze, an alloy of about nine parts of copper to one of tin, which is inferior in hardness to steel, but usually harder than iron.[1]

After the lapse of a period of time whose duration is yet undetermined, iron, which is far more difficult of extraction and fusion than copper, replaced bronze; at which point the third period or stage of European civilisation began.

It is sometimes rather difficult to draw the line sharply between the various ages which we have just enumerated; the work of one is often carried on into another. Thus for instance in a single cave of the island of Zeeland, flints simply splintered, and those which are polished or at least carefully fashioned, have both been discovered; and again during the age of bronze, even during that of iron, stone was still frequently used concurrently with metal. The discovery of one or more implements of stone in any given spot is, therefore, not a sufficient ground for asserting that these implements belong, actually and exclusively, to one or other of the palæolithic or neolithic periods established by Lubbock.[2]

In like manner, the use of bronze was not discontinued immediately after the dawn of the iron age; witness the tombs of Hallstadt in Austria, where bronze swords were

[1] It is supposed to be satisfactorily proved, that the iron age in Denmark extends back about as far as the Christian era; the age of bronze is supposed to have lasted about 2,000 years; lastly, the stone age, which includes the indefinite time previous to the bronze epoch, lasted for a thousand years, during which man occupied that country.

[2] In North America, for instance, implements of rough hewn stone are commonly found mixed with polished flints. It is therefore impossible to establish any chronological order.

found with axes and knives of iron. At Hallstadt the passage from one age to another was evidently slow and gradual. But elsewhere, in Switzerland for instance, at the time of the invasion of the Helvetians, the transition appears to have been violent, like social revolutions or the great disturbances of the earth's crust. In short it is easy to understand that in a given country, among a given people, a thousand circumstances may have influenced the successive or simultaneous use of stone and of metals. Hence arises a more or less pronounced inequality in the march of civilisation; the use of iron, for example, being known to one people, whilst another had only stone and bronze at its disposal. Thus in Liguria, no trace of the use of metal previous to Roman times has been discovered; the age of stone lasted in that country until the beginning of history; and finally, it was not until the early years of the present century that the Lapps abandoned the use of stone tools.

Even in our day groups of men exist who are still in their lithic age, and who are nevertheless in intimate and daily relations with peoples who have attained an advanced stage of civilisation. Such are the Australians, who cling persistently to their savage life, and continue to use weapons and tools of stone in presence of the metals of every kind introduced by the English. The modern Papuans remain stationary, while under the influence of British civilisation the fauna and flora of their native land are undergoing a change as radical and complete as that which might be produced by a sudden disturbance of the earth's crust.

The New Caledonians of the present day employ iron implements concurrently with axes of well polished stone. Sir Samuel Baker assures us that the inhabitants of Illuria (Northern Africa) use extremely primitive tools, such as anvils and hammers of stone, and yet at the same time they show remarkable skill in ironwork. Similar facts have been observed among the Kaffirs and the inhabitants of Polynesia. According to Charles Smart, surgeon in the United States army, the Lacaudones of Chiquis, the last

remains of a people whom the conquerors were unable to subdue, live in huts built of palm leaves, and hunt with stone-headed arrows, though they cultivate the sugar-cane and fruit trees.

We should, however, be drawing a false inference from these facts, in concluding that the tribes of which we have just spoken are still in the stone age properly so called. A slight examination will prove this conclusion to be erroneous, and will show that the simultaneous use of stone and metal is no rarer in our own day than it was before and during the Trojan war. A sufficient proof is furnished us by the example of the smiths and tinkers of Ireland, who until a comparatively recent period used in their daily work hammers and anvils of stone. M. Emile Burnouf assures us that in certain districts of the Levant pieces of flint fixed in a triangular piece of wood drawn by a horse are still used to chop straw for fodder.

If, therefore, as far as Europe is concerned, the exclusive use of stone may serve to characterise an extremely remote period, the case is different when instruments of metal are found in company with stone implements. Thus, when M. Moura, who represented the French interests at the court of the King of Camboja, discovered axes of polished stone among the strata of that country, the presence of wrought copper permitted our learned colleague Dr. Noulet to consider these implements as marking the transition between the neolithic and bronze ages.[1] The same inferences are naturally drawn on the several occasions when the simultaneous use of stone and metal has been found in Europe.

It is therefore indispensable, before pronouncing an opinion as to the real age of a flint implement, to be thoroughly acquainted not only with the place where it was found, but also with all the circumstances which attended its discovery. Moreover, the use of iron is not

[1] Dr. Noulet, *L'Age de la pierre polie au Cambodge, d'après les découvertes de M. Moura, lieutenant de vaisseau*, Toulouse, 1877.

necessarily preceded by that of bronze and copper (Northern Tartary, and Finland, are cases in point), and similarly copper and bronze may have been long in use among a people (such as the Mexicans and Peruvians), to the almost total exclusion of iron. As for the use of stone, unless it be exclusive, it does not, as we have just seen, imply any very marked social inferiority, still less any definite degree of antiquity.

Nevertheless some authors have attempted to establish precise dates, assigning 5,000, or 7,000 years, as the most remote limit of the stone age; 3,000, or 4,000 years, as that of the age of bronze; while the iron age would only have a duration of 2,000 years.[1]

It is needless to point out that, so far, no proofs are forthcoming in support of these assertions, and that every well-balanced mind should be on its guard against such precision, not to say audacity, of statement, since in the present state of science it is absolutely impossible that it can be trustworthy. We will therefore continue to employ this entirely relative or mineralogic chronology, until a better one is satisfactorily determined; taking especial care not to neglect the valuable data which palæontology, stratigraphy, and all industrial progress may furnish us. We must also remember that all the divisions we have established, of which the rigorous application is hardly admissible, even as far as Europe is concerned, cannot be applied with any certainty to America, Africa, or Australia. Indeed numerous facts which have been observed in America, tend to prove that it is not necessary for the complete social development of a people that it should pass successively through the three ages of stone, bronze, and iron.

As a summary of the preceding remarks, we may present them in a synoptic form.

[1] According to Count Gozzadini, it appears nearly certain that, if the use of iron only began in Scandinavia towards the beginning of the Christian era, the metal was employed at Villanova and Marzabotto at least as early as 1500 B.C.

MINERALOGIC CHRONOLOGY.

	Ages.	
	Stone.	Flints simply chipped (palæo- or archæolithic age of Lubbock[1]).
		Polished Flints (neolithic age, id.)
Metallic ages.	Copper.	Completely transitory, and apparently accidental in Europe.
		More real and permanent in America.
	Bronze.	Common to the two continents, but at different epochs.
	Iron.	Comparatively recent in America and Scandinavia, more remote in Italy and the rest of Europe.

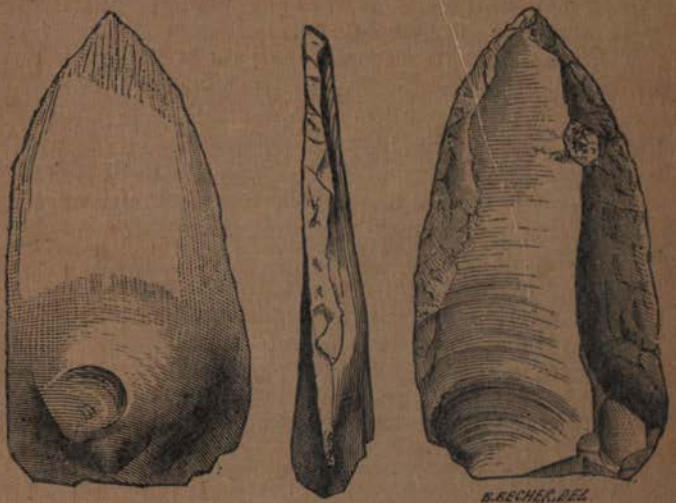
SAINT-ACHEUL TYPE. AXE, CARVED ON BOTH SIDES.
FIG. 4. Front view. FIG. 5. Side view.

M. de Mortillet has proposed to substitute for this chronology, which is altogether mineralogic, another founded solely upon the relative skill shown in the workmanship of the flints. Setting aside for the moment the flints of Saint-Prest and of the calcareous beds of Beauce, of which we shall speak presently, we give the following chronology, which we may call industrial:

1. The Saint-Acheul epoch, the oldest of the quaternary beds, characterised by its amygdaloid or almond shaped axes (figs. 4 and 5).

[1] Evans subdivides the neolithic age into two periods; that of *river gravel*, and that of the *caves*.

2. The Moustier epoch, with its scrapers, and triangular lance heads, worked only on one side (figs. 6, 7, and 8).



MOUSTIER TYPE. LANCE HEAD, CARVED ONLY ON ONE SIDE.
FIG. 6. Uncut surface. FIG. 7. Side view. FIG. 8. Carved surface.

3. The Solutré epoch, with its beautiful arrow-heads cut in the form of laurel leaves (fig. 9).

FIG. 9. SOLUTRÉ TYPE. LANCE HEAD.

4. The Madelaine epoch, in which bone implements and weapons are found with those of stone.

5. The Robenhausen epoch, or that of polished stone.

These divisions are worth consulting, for they are useful landmarks in this long series of centuries which must have elapsed between the earliest traces of human industry and the age of bronze properly so called.

Unfortunately, in this case also, the authors who have paid most attention to this subject are far from being agreed; and the determination of the limits and nature of prehistoric epochs is at present characterised by a certain vagueness which future discoveries and comparisons will doubtless help to dissipate.

Professor Broca, by turning to account the data furnished at once by stratigraphy, palæontology, and archæology, has already been able to establish among the data in question a certain agreement or concordance, of which the following table may serve to show the importance and appropriateness.

PREHISTORIC CHRONOLOGY OF THE QUATERNARY EPOCH.

		Stratigraphical Data	Palæontological Data	Archæological Data
Quaternary epoch	Archæolithic period	Low levels of undisturbed valleys	Age of the mammoth	Age of carved stone or archæolithic age: axe of Saint-Acheul.
		Mean levels	Id. intermediate	Arrow head of Moustier
		High levels	Id. of the reindeer	Id. of Solutré
Neolithic period		Recent beds	Modern fauna	Polished axe
Metallic period		"	"	Age of bronze
		"	"	Age of iron

It was for some time generally believed that the age of stone was confined to northern Europe. It is now established beyond dispute that every part of this continent at one time employed carved flints to the exclusion of all metal, and that the age in question has been more or less fully represented, at different times, not only in Scandinavia, but also in Finland, Germany, France, Italy, England,

Belgium, Syria, Palestine, in Egypt, China, Japan, in India, and even in America. Finally, it must be remembered that all we have said respecting the succession of the different ages applies almost exclusively to Europe, sometimes exclusively to France.

Certain authors, among others MM. de Mortillet, Cartailhac, and Forel, of Lausanne, have asserted that there exists an immense interval between the palæolithic and neolithic ages, considered from the three points of view of ethnology, palæontology, and workmanship. But M. Cazalis de Fondouce maintains that no such interval exists.[1] He holds first, with M. de Quatrefages, that there was a continuity of race during the two epochs, and that a great part of the present population of Europe is descended from those prehistoric men whom we are now considering; and he maintains that, in the quaternary fauna, between the ages of carved and of polished stone, there is the same continuity. Successive extinctions have taken place, clearances brought about gradually in the lapse of time, from the disappearance of the cave bear and of the mammoth to the migration of the reindeer and of the musk ox towards colder climates than our own; but the animals of the neolithic period, and even those of modern times, are the survivors of that ancient fauna in the midst of which dwelt the men of Abbeville and Cro-Magnon. The quaternary flora, as we shall presently see, leads us to precisely the same conclusions. In short, everything tends to show that there is direct filiation between the rude workmanship of the flint of Saint-Acheul, and the skilled workmanship of the flint of the neolithic age. But a still better proof that this gap, assumed to exist by certain archæologists, is purely imaginative, is to be found in the recent discovery of a deposit which presents the manifest transition between the ages of splintered and of polished stone. I allude to the cave of Duruthy, situated near Sorde (Basses Pyrénées), where MM. Lartet and Chaplain-Duparc have observed 'a human race, associated in Périgord with the mammoth,

[1] See Cazalis de Fondouce, *Pierre taillée et Pierre polie, lacune qui aurait existé entre ces deux âges; Revue d'Anthropologie*, 1874, p. 631.

the lion, and the reindeer,' first in the age of triangular bone arrow-heads (Cro-Magnon), then in that characterised by the barbed bone arrow-heads, and representations of animals (La Madelaine, Laugerie Basse), and which, after manifesting itself in the fully developed artistic phase at the bottom of the cave discovered at Sorde, is found again towards the upper part of the same cave, with flint weapons, which from their finished form and rudimentary polish might almost be classed in the age of polished stone.[1]

In conclusion; the three ages of stone, bronze, and iron have not been in all places and at all times successive, but very often simultaneous. Though they mark three stages in the civilisation of nations, it does not follow that all have passed through them at the same periods. The chronological value of these ages is not always therefore absolute and general, but sometimes purely local and relative. Finally, flint implements are so far from being themselves, and in all cases, the distinctive marks of a very remote epoch, that many tribes, even among those to whom the use of iron is known, often employ stone in preference to metal. On the continent of Europe the general series of facts has everywhere been the same, but the details, the particular characters, have varied according to a great number of local circumstances. Though they resemble each other, there is not always perfect synchronism. It is not therefore to be wondered at, if we are still, as regards many points, reduced to mere conjecture and hypothesis. The important point is the establishment of the principal landmarks; this has been already done more or less successfully; the future will decide whether it is necessary to displace them.

IV. THE GREAT ANTIQUITY OF MAN PROVED BY EGYPTIAN MONUMENTS.

Formerly learned men regarded the famous lists of the kings of Egypt, drawn up by Manetho, as apocryphal and false, lists which ascribed an extremely remote date

[1] Louis Lartet et Chaplain Duparc, *Une sépulture des anciens troglodytes des Pyrénées*, Paris, 1874.

to the most ancient dynasties. At the present day the curious monuments brought to light by the excavations of M. de Mariette have shown that far from having gone beyond the facts of history, and 'over-crowded his picture with imaginary Pharaohs' (as M. Maury has happily expressed it), Manetho has omitted several whose inscriptions and devices modern Egyptian scholars can read almost as easily as the inscription on the Pantheon may be read in Paris.

It is no longer disputed that 'on the banks of the Nile art and civilisation date from a time anterior to all history; that Egypt was from the beginning cast in a mould which has hardly changed with ages, and which the foreign conquerors who succeeded in establishing their rule in the land were forced to respect.'[1]

The development of this idea, which strongly supports our own theory, forms the subject of a learned paper by this well-known Academician, with which the readers of the 'Revue des deux Mondes' are doubtless acquainted. In order to dissipate every legitimate doubt as to the great antiquity of the Egyptian people, and of their civilisation and their arts, it is not necessary to cross the sea, to go to Karnac and to penetrate into its temple, four times as large as Notre Dame in Paris, although it was reserved exclusively for the devotions of the king. It was enough to visit the little temple of Philæ in the Champ de Mars, where the rich treasures of the Egyptian exhibition (1867) were displayed to the eyes of all nations. Their artistic beauty and richness, and above all the art displayed in the adorning of the sepulchres, were very remarkable. This is due to the fact that the inhabitants of the Nile, ever preoccupied with the idea of a future life, looked upon the tombs 'as their true abodes throughout eternity' (Alfred Maury). Here were exposed coffins in the form of mummies, entirely covered with symbolic figures whose colours have resisted the ravages of time, and two statues, the one of diorite, the other of green basalt, representing the king

[1] Alfred Maury, *L'ancienne Egypte d'après les dernières découvertes; Revue des deux Mondes*, Sept. 1, 1867, p. 183.

Chafra or Chephren (the fourth king of the fourth dynasty, and the builder of the second of the great pyramids); statues so well preserved, one of them especially, that they appear to be 'fresh from the hands of the able sculptor by whom they were carved more than 5,000 years ago.'

Art does not attain at once to that grace of line and truth of expression of which the face of Pharaoh, son of Ra, the sun-god (Chafra), offers us an example. Side by side with these statues of the king Chafra or Schaffra we may place the wooden statue of one named Ra-em-ke, remarkable for its wonderful state of preservation, and also for its beauty as a work of art, unsurpassed by any of the Greeks, as we are told by a competent judge.[1] This Ra-em-ke was the governor of a province during the fifth dynasty, that is to say, about a century later than king Schaffra. Lastly, the door of the great pyramid of Sakkara, now one of the most precious treasures of the Berlin Museum, formed part of a monument, which, if it were really built, as it is generally believed, under the first dynasty,[2] has withstood for nearly sixty-eight centuries the destroying hand of man and of time.

'Such figures terrify the imagination. Forty-nine centuries before the birth of Christ is a great age for a work of human hands, and above all, for a true work of art. Neither India, Asia, nor Assyria have any relics of a time which approaches so nearly to the origin of humanity. But that which is really overwhelming to the mind is to find at that date, not savage tribes, but a powerfully constituted society, of which the formation must have required the lapse of centuries; a civilised people advanced in science and art, and in the knowledge of mechanics, capable of raising monuments of immense size and of indestructible solidity.'[3]

I shall only mention the jewels found at Thebes on the mummy of the queen Aah-hotep, mother of king Amosis,

[1] M. Fr. Lenormant.

[2] Under King Onennephes, 4895 B.C.

[3] F. Lenormant, *L Antiquité à l'Exposition universelle; Gazette des Beaux-Arts*, Sept. 1, 1867.

jewels of unequalled finish and beauty, although they date from the time when Joseph became the minister of the then reigning Pharaoh. Necklaces, bracelets, mirrors, and sacred axes of bronze, carved and gilt, a richly worked dagger, enamelled earthen vases, &c., all these works of antique art excite our surprise and admiration. 'Neither Greece nor Etruria,' we are told by M. Lenormant, 'has produced any jewels which surpass those of the queen Aah-hotep in grandeur of conception, in elegance and purity of form, or in beauty of workmanship. But imagination is confounded at the thought that these ornaments, which reveal such a high degree of artistic culture, such wonderful manual skill in the workmen, are the product of a time of civil trouble and of war, when Egypt was painfully emerging from a long-continued struggle with a horde of barbarians (*hyksos* or shepherd kings) whose invasion had covered her land with ruins.'

It is time to conclude, but I cannot refrain from noticing two other objects in a wonderful state of preservation which were exposed in the collection of M. Mariette. Here again M. Lenormant shall speak for us. 'The graceful wooden spoon, which represents a young Nubian girl swimming and pushing an oval basin before her on the surface of the water, is of the time of Moses. With a little imagination we might almost believe that it lay on the table of Pharaoh's daughter. This charming little basket, with a cover woven of parti-coloured cane, and admirably preserved, which one of our own ladies might use as a work-basket, was found at Thebes in a tomb of the eleventh dynasty. It is therefore two centuries older than Abraham. Many centuries must have elapsed before such a degree of perfection was attained, and we are, indeed, far removed from the first attempts at sculpture which have been dug out of the caverns of Languedoc and Périgord. Yet there can be no doubt that Egyptian art, so perfect under the reign of Chephren and his successors, began by equally rude attempts. But from what remote age they date, or what were the names of those earlier artists, we know as

little as we know who were the sculptors whose chisel created the sphinx and the statues of the kings.'

We must add that in the remote epochs of which we are speaking, the Egyptian tongue was already formed, and possessed a written character. The greater number of our domestic animals were bred by the Egyptians, and distinct and long established breeds were known to them (greyhounds, lop-eared goats, &c.). No one can tell with certainty the number of centuries they must have passed through before attaining to so complex a civilisation. The whole history of Egypt confirms our belief in the immense antiquity of the human race.

We pass on now to compare the remains of primitive industry preserved in the diluvian gravel of the valleys or the sediment of the bone caves with the works of Egyptian art. We must study the flints and the lesson to be drawn from them.

CHAPTER II.

THE WORK OF BOUCHER DE PERTHES.

I. THE SPLINTERED FLINTS OF ABBEVILLE.

To the history of the diluvium a discovery belongs which, though insignificant in appearance, is in reality of the utmost importance from its bearing upon primitive industry: I allude to the flints, sometimes merely chipped into shape, sometimes carefully polished, found in such abundance and in such widely distant parts of the earth, from Paris to Nineveh, from China to Camboja, from Greenland to the Cape of Good Hope. Although the true nature of these flints has not been made known to us for more than forty years, the ancients knew of their existence, and, at least to those that were polished, they gave the strange names of *lapides fulminis*, *ceraunix gemmæ*, which expressed the strange notion that they had fallen from the skies with the thunderclap, or were formed in the earth by the fire of Jove. They afterwards came to be looked upon as 'freaks of nature' (*lusus naturæ*): as early as 1734, Mahudel, and after him Mercati, ventured to say that they were the weapons of antediluvian man, but this bold assertion was received with ridicule and incredulity.

Buffon in 1778, in his 'Epoques de la Nature,' affirmed again that the first men began by sharpening into the form of axes these hard flints, jades, or thunder-bolts, which were believed to have fallen from the clouds and to be formed by the thunder, but which, said he, 'are merely the first monuments of the art of man in a state of nature.' This just theory passed unnoticed at the time, but all scientific men are now agreed upon its truth. But it

is to M. Boucher de Perthes that the honour belongs of having dispersed all doubts and inspired conviction. From the year 1836 to 1841 he made researches, pickaxe in hand, among the ancient tombs, the caves, the peat mosses, the diluvium of the valleys and of the bone caves, and collected thence flints of a remarkable form, more or less sharpened at the edges, presenting a number of unequal facets, and shaped like axes or knives. The origin of these chipped stones and the strata to which they rightly belong form the subject of a series of ingenious inductions, and of prophetic remarks which the event soon justified. I leave the author to speak for himself:

'The yellowish tinge of some of these chipped stones of the diluvium was a first indication. This tinge was not that of the flint itself, but was entirely superficial, whence I concluded it was due to the ferruginous nature of the soil with which the stone had come in contact. A certain layer of the diluvium fulfilled this condition; the shade of colour was precisely that of my axes. They had been imbedded in it, but the question remained whether their presence there was the effect of a recent revolution, and later displacement, or if it dated from the formation of the bed. If the axe was in the bed from its beginning the problem was solved; the man who had made the implement was anterior to the cataclysm to which the deposit owed its formation. In this case there is no possibility for doubt; for the diluvian deposits do not, like the peat-bogs, present an elastic and permeable mass, nor a gaping chasm like the bone caves, open to every comer, and which have for centuries served as a shelter, and then as a tomb, to so many different creatures; in such a mixture of all ages, in this neutral bed, a species of caravanserai for past generations, it is impossible to characterise the different epochs.

'In the diluvian formations, on the contrary, each period is sharply defined. The horizontally disposed layers, the strata differing in colour and substance, show us the history of the past in clear characters: the

great convulsions of nature seem to be traced upon them by the finger of God.

'Here the proofs begin; and they cannot be gainsaid, if this work of human hands, of which I said, "It is there," has remained there from the first. As irremovable as the bed itself, it came with it, and has there remained, and since it has aided in its formation, it had a prior existence.'[1]

This work of human hands, to which M. Boucher de Perthes was devoting all his efforts, was 'those rude stones which in their imperfection prove the existence of man no less surely than such a building as the Louvre itself could have done.'

He had found the proofs which he sought so eagerly, and in 1839 he brought them from Abbeville to Paris: but the axes and knives of the diluvium excited the ridicule of geologists, and inspired them with doubts as to the sanity of the man of genius who came with a candour which does him honour, to submit his discoveries to those who could not understand him. They were afraid of these stones, whose language, as interpreted by M. Boucher de Perthes, concealed, as they thought, some heresy or mystification; and for a time the flints of Abbeville were condemned to ridicule or oblivion. But fortunately, as it nearly always happens, truth, long unrecognised, ended by overcoming the systematic resistance, the absurd prejudices, and the presumptuous incredulity of its opponents. They consented at last to examine the discoveries, and thenceforward doubt became impossible. They had under their eyes the manifest proof of human workmanship of a much earlier date than the earliest traditions, or than the monuments which the most remote antiquity has left us.

In spite of the evidence of proofs, the question was not generally considered to be resolved; objections poured in from every quarter. Some maintained that these fractured flints were not of human workmanship; that they were of volcanic origin; melted by intense heat, and

[1] Boucher de Perthes, *De l'homme antédiluvien et de ses œuvres*, p. 3, Paris, 1860.

thrown up into space from the crater, they fell back into the water in the form of a vitrified glass. Others attributed them to the action of frost, which had split the flints so adroitly as to cause them to take the form of axes and knives. The means by which they were introduced into the diluvian beds was easily explained by the assertion that the workmen employed in the excavations had placed them there. Some even went so far as to maintain that these axes had penetrated the upper layers in virtue of their own weight, as if the beds in which they are found were sufficiently permeable ever to have allowed of such infiltration.

Some well-known geologists asserted that these deposits were of recent origin, or at least but little earlier than the arrival of the Romans in Gaul. Others, considering them to belong to the quaternary epoch, that is, to a prehistoric period, have maintained the opinion, unsupported by any adequate proof, that these strata have been disturbed by man; that is, that their original position has been changed long after their formation. Others again asserted that these chipped stones were merely gunflints: 'a remarkable statement,' said a critic, with a spice of malice, 'which proves that its authors were very certainly not the inventors of gunpowder.'

Indeed these objections are not serious, and it seems astonishing that they can have been seriously made by their authors. The first, which attributes the origin of the flints to volcanic action, may be classed with the ancient notion which attributed to Jove the origin of the *lapides fulminis*, of the *ceraunia gemma*. The second, which explains the origin of these same flints by the action of frost, is no explanation at all. To admit the third, we must admit also the most complete understanding among the workmen of every country, and these are not a few, where artificially shaped stones have been found in the diluvium. The fourth objection, asserting that the stones deposited on the surfaces of the diluvian beds have by their own weight buried themselves in them, is sufficiently refuted by its own absurdity.

There remains, then, only the assertion of those who hold that the diluvian strata, displaced after their formation, received at a comparatively recent epoch the axes and knives which they contain. But as M. Boucher de Perthes reasonably demands, by whom were they displaced? Not by man, for the whole population of Gaul would not have sufficed for the task, even if the diluvium of Abbeville were alone in question. The utter impossibility of such a displacement is made manifest when we consider that the same phenomenon, that is, the presence of hewn flints, has been observed in the same situations and in identical circumstances in all quarters of the globe.

Moreover, the bones of extinct animals, of fossil animals in the sense which Cuvier himself attached to the word, are nearly always found with the flints in question. Such are the *Elephas primigenius*, the *Rhinoceros tichorhinus*, &c. Again, a whole limb of the *Rhinoceros hœmitœchus* was found at Menchecourt, of which the different bones were still, as it were, articulated and placed each in the position which they had occupied during life. Certainly, if, as it must be admitted, this limb had occupied undisturbed for thousands of years its original position in the gravelly bed where it was found, it is impossible still to deny that the hewn flints lying beside it were contemporaneous with it.

Many other similar or analogous facts have been observed. However, it must be owned that we cannot conclude with absolute certainty that they are of the same date from the fact that the flints are frequently found in company with the bones of extinct species. It is just possible that violent currents had borne along in their course and mingled together the *débris* of very different epochs. But doubt would be no longer possible if unequivocal traces of human workmanship were discovered upon the bones found buried in the same beds with the flints.

Our learned colleague, however, M. Ed. Lartet saw, and many others have since seen, incisions made by a sharp instrument, probably a flint knife, upon the bones of the

rhinoceros, and upon the antlers of stags of extinct species which were found in all the diluvian beds of the valley of the Somme. Similar examples have since been repeatedly remarked, and there is no tolerably complete collection which does not contain flint implements found in company with the antlers and bones of extinct animals, bearing the marks of the teeth of saws or of incisions made in order to detach the skin from them, to separate them from the skull, or to divide them into fragments of a convenient size.

We may conclude then, that the flints of the diluvium of Picardy are the productions of human art, proving that the man of Abbeville lived at the same time as the mammoth and the *Rhinoceros hæmitœchus*, that is to say, at an altogether prehistoric period. At that time the bed of the Somme was 60 ft. higher than its present level; the river had not then hollowed out the valley in which it now flows. England was not separated from France by the Straits of Dover at the epoch of which we are speaking; and supposing London and Abbeville to have been then in existence, the traveller might have gone from one town to the other on foot. The Rhine valley stretched away to the northward across the plains not yet submerged beneath the German Ocean, and received the tributary waters of the Humber, the Tweed, and the Thames, whose streams were fuller and more rapid than they are in our day. The Rhine and the Rhone, abundantly fed from the same source, hollowed their vast beds, bearing along in their currents the *débris* of the contemporary fauna, and burying with them the stone implements of our European ancestors in the fresh deposits which they formed.

Nevertheless, in spite of the important results obtained by the patient researches of M. Boucher de Perthes, the Institute, for more than fifteen years, regarded with the most complete indifference the discoveries of the learned antiquary of the Somme. Finally, however, its members were obliged by the force of circumstances to cast a more or less contemptuous glance upon these dis-

coveries. A paper[1] written by Dr. Rigollot, at first the declared adversary, but afterwards the warm partisan of the theories of Boucher de Perthes, drew the attention of the first scientific body in France to the 'Antiquités Diluviennes,' a book which contains, it is true, many daring conjectures, but at the same time a number of convincing facts, ingenious theories, and unanswerable arguments.

As the author says, 'this attention was not kindly. A purely geological question was made the subject of religious controversy. Those who threw no doubt upon my religion accused me of rashness: an unknown archæologist, a geologist without a diploma, I was aspiring, they said, to overthrow a whole system confirmed by long experience and adopted by so many distinguished men. They declared that this was a strange presumption on my part. Strange, indeed; but I had not then, and I never have had, any such intentions. I revealed a fact; consequences were deduced from it, but I had not made them. Truth is no man's work; she was created before us and is older than the world itself; often sought, more often repulsed, we find, but do not invent her. Sometimes too we seek her wrongly, for truth is to be found not only in books; she is everywhere; in the water, in the air, on the earth; we cannot make a step without meeting her, and when we do not perceive her it is because we shut our eyes or turn away our head. It is our prejudices or our ignorance which prevent us from seeing her, from touching her. If we do not see her to-day, we shall see her to-morrow; for strive as we may to avoid her, she will appear when the time is ripe. Happy the man who is prepared to greet her, and to say to the passers-by, Behold her!'[2]

As the Institute of France had so long refused to listen or to believe, it is not astonishing that the public remained indifferent or incredulous, and that as late as 1853 M. Boucher de Perthes was still asked how it was that

[1] Dr. Rigollot, *Mémoire sur les instruments en silex trouvés à Saint-Acheul*, Amiens, 1851.

[2] Boucher de Perthes, *De l'homme antédiluvien et de ses œuvres*, p 13, Paris, 1860.

his pretended antediluvian axes and knives were only to be found in the gravel beds of the valley of the Somme; how it happened that he alone had found any such? Numerous facts gave a prompt reply to these questions, of which the contempt and incredulity were ill-disguised. Others were sought for and were found, indeed, had already been almost unconsciously found.

In fact, without going back to the precise details which antiquity has furnished us respecting the flints called thunder-bolts, there is in the British Museum a stone weapon, found by Conyers, as the label tells us, more than a century and a half ago, with an elephant's tooth, near Gruyes. This weapon, which, according to Evans, is rudely sketched in a letter on the antiquities of London, dated 1715, is the exact reproduction of the flint lance heads so common in the diluvian beds of Abbeville and Saint-Acheul.

A century later than Conyers, in 1800, John Frere found in a gravel quarry at Hoxne, in Suffolk, flint tools of the same type as those since found in the valley of the Somme, and like them, intermixed with bones of extinct elephants and rhinoceros. Similar discoveries have since been made in every quarter of the globe. Thus in this case also, truth, long denied and banished, has overcome systematic and contemptuous incredulity, and, at the moment I write these lines, there is no scientific man who is not convinced that the most rudely shaped flints show human workmanship as clearly as the axes of the Roman lictors: for 'the flints speak,' says Lubbock. We have heard and have still more to hear of what they have to tell us.

II. DISCOVERY OF THE JAWBONE OF MOULIN-QUIGNON.

On March 23, 1863 (we are careful to give this memorable date), M. Boucher de Perthes was gratified by the discovery, at Moulin-Quignon, of the famous jawbone, or rather the part of a human jawbone, which became the subject of so much controversy. It lay imbedded about five yards deep in dark sandy gravel, the

colour of which was due to an admixture of manganese and oxide of iron, and which was in immediate contact with the subjacent chalk. The same bed contained carved flint, axes of the Saint-Acheul type, and teeth of the mammoth (*Elephas primigenius*). On April 24, in the same year, M. de Quatrefages made known this discovery in the author's name to the members of the Institute, proclaiming it to be 'one of the most important which could be made in natural science.' (See fig. 10.)

All the newspapers, not only the scientific journals, but also the political organs, vied with each other in spreading the news of the discovery; and it was indeed

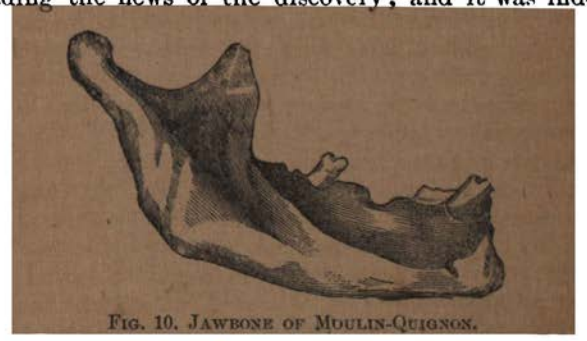


FIG. 10. JAWBONE OF MOULIN-QUIGNON.

a memorable event. Following the example of M. de Quatrefages, who had been one of the first to visit Abbeville to inspect the place of this important discovery, and to enquire into all the accompanying circumstances, several English savants, whose names are justly celebrated (Evans, Falconer, Prestwich, all members of the Royal Society, who had already visited Abbeville in 1859), again visited France, and having entered at once upon a strict and conscientious enquiry into the alleged facts, they began to entertain doubts as to the authenticity of the jawbone, and to suspect that it might have been fraudulently introduced by the workmen into the bed where it was found. Far from denying in a general way the great antiquity of the human race, these men of science had more than once brought proofs in its favour,

but in the present case they did not feel absolutely convinced, and they said so honestly.

Their doubts were principally due to the close resemblance which this jawbone bears, physically and anatomically, to other inferior maxillaries belonging to members of races now in existence. Prompted by the desire of dispelling such doubts, and of resolving at once and for all the important question in debate, M. de Quatrefages proposed that a kind of congress should be held, at which, after having seen and handled the subject of dispute, English and French men of science should discuss together the difficult or disputed points and then draw their conclusions.

In accordance with this suggestion, Messrs. Busk, Carpenter, Falconer, and Prestwich went to Abbeville. Among the French savants were MM. Milne-Edwards, de Quatrefages, Desnoyers, Delesse, Lartet, Daubrée, Delafosse, Hébert, Albert Gaudry, P. Bert, Alph. Milne-Edwards, de Vibraye, Dr. Vaillant, l'Abbé Bourgeois, Dr. Garrigou, &c. M. H. Milne-Edwards was chosen president of the congress. After the facts had been examined and discussed, it was unanimously agreed that the axes and the jawbone of Moulin-Quignon were really authentic, and that fraud had had no part in their burial. However, Messrs. Busk and Falconer still desired to make some reservations, and the latter requested that the following declaration should be annexed to the report. 'My opinion is that the discovery of the human jawbone is authentic, but that neither its characteristics nor the conditions under which it was found, sufficiently prove that the aforesaid jawbone is of very great antiquity.'

Messrs. H. Milne-Edwards, de Quatrefages, Lartet, Prestwich, and Carpenter, on the other hand, remained firm in the belief that this human relic belonged to an extremely remote date. M. Pictet of Geneva, and the immense majority of geologists, both French and foreign, embraced this opinion, and declared that the man of Moulin-Quignon had witnessed the geological phenomenon which had deposited the beds of diluvian gravel.

Messrs. Falconer and Busk did not remain long unconvinced. One dissentient voice was raised, however, in the midst of the general concord, and affirmed in the Academy of Sciences at Paris, that neither the axes of Moulin-Quignon, nor those of Menchecourt, and of Abbeville, nor even those of Grenelle and Clichy, should be considered as diluvian. Subsequent causes had imbedded them in these strata, which had been disturbed and were even comparatively modern. Therefore, added the same Academician, a great authority in geological questions, it is a mistake or a chimera to believe that man was the contemporary of the mammoth or the diluvian rhinoceros. This incredulous, or at least exceedingly cautious Academician, was M. Elie de Beaumont.

On the other hand, we can oppose to this well-known name those of MM. Prestwich, Lyell, Lartet, Desnoyers, Gaudry, and others, who all maintained that the beds of Abbeville and of Moulin-Quignon belonged to the quaternary epoch, and had remained undisturbed from the day of their formation.

This was the state of affairs, and the 'trial of the jawbone' seemed to be at an end, when on July 18, 1864, M. de Quatrefages communicated to the Academy a new *Note*, in which he announced that M. Boucher de Perthes had just found, in the district of Moulin-Quignon, already so famous, a second jawbone, a skull, and other human bones. The author of the memorandum insisted upon the identity of the spot, upon the precautions taken to avoid deception, and he declared himself to be as before, absolutely convinced of the authenticity of these remains. The learned Academician left it to geologists to determine the age of the beds whence they were taken, and also the antiquity of the human race buried therein.

The question now appeared to be definitively settled, for so many minute precautions, such a careful examination, such learned consultations, with names so justly respected, seemed to be a guarantee of the truth which was above the least suspicion. Yet it was whispered, and even audibly spoken in certain circles which profess to be well

informed, that the members of the Congress of Abbeville were the victims of a monstrous fraud, and Evans himself repeats that 'I do not of course allude to the too celebrated Moulin-Quignon jaw, over which I have already pronounced a *Requiescat in pace*.'[1]

Even granting that this deception was really practised, no one can deny that the skulls of Grenelle and of Clichy, of which we shall soon have occasion to speak, were taken from an undisturbed bed of grey diluvium, as ancient as that of Moulin-Quignon. The skulls of Neanderthal, of Engis, &c., and the jawbones of Naulette (figs. 11 and 12),

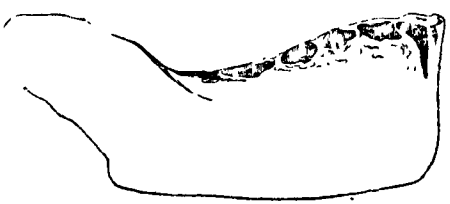


FIG. 11. JAWBONE OF NAULETTE.

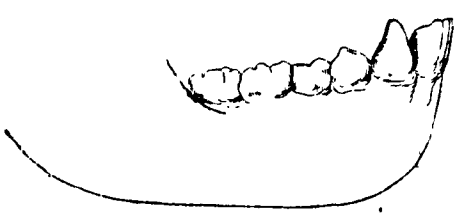


FIG. 12. JAWBONE OF CHIMPANZEE.

of Aurignac, and of Arcy, found in the bone caves of the palæolithic age, also bear strong testimony in favour of the great antiquity of the human race. It is in the caves therefore that we will now seek our proofs. But here, more than anywhere else, we must surround ourselves with

[1] See Evans, *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain*, p. 617. Although human bones have not yet been found in the diluvium of English valleys, the author whom we have just quoted admits that the human race is contemporaneous with the extinct animals of which the remains are found abundantly in France in the same diluvium, or in a number of bone caves.

minute precautions. We shall have to examine the bones and other objects which are found there, and determine whether they are buried in a virgin soil which has never been disturbed; since it is on this condition only that we can draw certain conclusions from the facts which have been observed.

CHAPTER III.

THE BONE CAVES.

I. HISTORY OF THE QUESTION.

EVERY important discovery is generally preceded by partial discoveries which herald or foreshadow its approach. Some fact attracts the attention of an observant mind; another similar fact appears, perhaps simultaneously, perhaps after an interval of greater or less duration; other phenomena of like nature group themselves around the first; and this assemblage of scattered gleams produces a ray of light which at length strikes the eyes of all beholders. But the new idea which shines out brilliantly from the surrounding obscurity is nearly always opposed to the reigning opinion which has become, so to speak, an article of scientific, often even of religious faith. Hence arise a strenuous opposition, a more or less passionate strife, until at last the human mind can enjoy its new conquest in peace.

Such is the approximate history of every question which has been the subject of human dispute. That which concerns the synchronism of our species with the great extinct mammals could form no exception to the general law. Proofs of this fact are now abundant; and the bone caves have furnished a contingent which is by no means to be despised.

As early as 1828, Tournal of Narbonne announced to the scientific world the discovery of human remains,[1] and of things fashioned by the hand of man, in the cave of Bize (Aude) intermixed with bones of animals which

[1] A fragment of the superior maxillary.

Cuvier himself considered as fossil in every acceptation of the word. This discovery, important in every point of view, was received with a caution which was almost excessive, even on the part of the Institute.

It is true that the proof is not absolutely complete, since the cave of Bize was at one time believed to date only from the time of the reindeer, and, as it was said, contained no remains of the cave bear, nor of the cave hyena, nor of the mammoth, nor of the *Rhinoceros tichorhinus*, &c., in a word, of none of the great characteristic mammalia of the beginning of the quaternary epoch. But at the present day every serious objection disappears in face of the facts attested by Gervais, that the cave bear and cave hyena do occur at Bize, that he has himself found them there, and that consequently the cave is of more ancient date than was originally believed. We cite the words of the learned professor of the museum, who is known to be as a rule opposed to the theory of the great antiquity of man.

'I maintain that the *Ursus spelæus* and the *Hyæna spelæa* are buried in the same place as man; and that the cave of Bize may be cited as a proof in support of the opinion that our species was the contemporary of these two great carnivora.'[1]

Every doubt as to the contemporary existence of man and of extinct species should have disappeared, when on June 29, 1829, M. de Christol, then secretary of the Société d'Histoire Naturelle of Montpellier, submitted to the Institute a paper entitled, 'Notice sur les ossements fossiles des cavernes du département du Gard.' The author of this work, which received at the time less notice than it deserved, after having carefully examined the caves of Pondres and of Souvignargues (Gard), adduced new and conclusive facts in support of those already cited by M. Tournal. He proved incontestably, as we think, that the cave of Pondres, being entirely filled by the diluvium at the time when he visited it, could not have

[1] Gervais, *Recherches sur l'ancienneté de l'homme et de la période quaternaire*, p. 54.

received any substance of modern or foreign origin, which has sometimes happened with certain hollows more easy of access. He showed further that the bones of hyenas and the fragments of pottery which occur there are found at every depth, and that the human remains are 'in precisely the same geological conditions as all the other bones with which they are associated.'

At Souvignargues M. de Christol dug out of the deepest part of the *undisturbed* diluvium a humerus, a radius, a fibula, a sacrum, and two vertebræ, which had formed part of the skeleton of an adult of small size, perhaps of a woman, as Professor Dubreuil thinks.

In 1833 Dr. Schmerling explored the numerous caves of Belgium, and in several of them, notably at Engis and at Engihoul, near Liège, he ascertained the existence of skulls and of portions of the human skeleton, together with those of bears, hyenas, elephants, rhinoceroses, &c., lying in the diluvian deposits, sometimes above and sometimes below the remains of these species which are already universally recognised as fossil. Bones and flints shaped by human hands, extracted from the same beds, served to confirm Schmerling in the belief that man was the contemporary of the extinct animal population whose remains he had found.

The conclusion was no doubt logical, and yet it was opposed by several geologists of great authority. Lyell himself did not at first admit it (1833); but more than a quarter of a century later (1860), on the occasion of a visit to the Schmerling collection, and to several of the places whence the specimens it contains were extracted, the famous author of the 'Principles of Geology' frankly acknowledged and retracted his error, in terms which are still more creditable to his character than to his judgment.

This brings us to 1835, the date at which I, an unknown disciple of science, ventured to maintain that man was perhaps the contemporary of the bears whose remains I had lately found at Nabrigas (Lozère) together with a fragment of pottery of early workmanship, which was

judged worthy by M. Christy to be cast at Toulouse for the purpose of enriching the principal museums of France.[1]

My paper, which was published in the 'Bibliothèque Universelle' of Geneva, being the work of an unknown author, attracted very little notice in France, and in spite of the new proofs which it brought forward in support of the theory of the co-existence of man and extinct species, was perhaps for that very reason, forgotten or ranked with those rash assumptions then called *juvenile*, of which my learned predecessors MM. Tournal and Christol had given me the example. I hope the reader will pardon me this personal allusion, this return towards an already distant past, which recalls to me my early beginnings in science, to which I have with disinterested devotion consecrated the greater part of my life.

In 1838 a work appeared entitled 'Essais sur les cavernes à ossements et sur les causes qui les y ont accumulés.' After enumerating the different places where either human remains or fragments of human industry have been found, the author, M. Marcel de Serres, concludes by saying: 'It appears then an established fact . . . . that man was the contemporary of the extinct species whose remains are found scattered in certain of the bone caves of Europe' (p. 198). It is true that, in 1860, Marcel de Serres expressed a very different opinion. 'It appears,' he says, 'that the true beds of diluvian deposit, also called diluvium, do not contain the least trace of bones, nor of human industry and remains.'[2] At the present day few, if indeed any, geologists share this later opinion of the Montpellier professor.

In England the bone caves had also been eagerly explored, but often without method, and with preconceived ideas. The important work of Dr. Buckland, published in 1823, under the title of 'Reliquiæ Diluvianæ,' had

[1] I presented one of these casts to the Museum of Natural History at Toulouse.

[2] Marcel de Serres: '*Des espèces perdues, et des races qui ont disparu des lieux qu'elles habitaient primitivement*' (*Annal. Scient. Naturel.*, t. xiii. p. 360, 1860).

attracted considerable attention among scientific men; but it maintained that man was not contemporary with the extinct species. The discoveries made in 1842 in Kent's Cavern, near Torquay, Devonshire, by Mr. Godwin Austen, clearly disproved these conclusions, but without convincing geologists or palæontologists.

The year 1858 marks the beginning of an important era. A reaction against the too absolute opinions of Dr. Buckland set in in England, and this opposition originated in the Royal Society. Several of its most eminent members, among others Falconer and Prestwich, were commissioned by the Royal Society to explore with the greatest care the recently discovered cave of Brixham (Devonshire), and to draw up a report on the subject. Among a quantity of carved flints and bones of extinct species, an entire left hind leg of *Ursus spelæus* was found lying above the incrustation of stalagmite which covered the bones of other extinct species and the carved flints. The bear had therefore lived after the manufacture of these flint knives, consequently after the men who fashioned them. These men were therefore more ancient than the cave bear.

Such were the conclusions of the Royal Society, and they were shortly afterwards confirmed by discoveries similar to those made at Brixham, notably by those of the cave of Long Hole (Glamorganshire), where Colonel Wood, in 1861, found imbedded in the same stratum flint tools of the type of those of Amiens, together with bones of the *Rhinoceros hæmitœchus*, which is of yet earlier date than the *tichorhinus*.

From all these facts we gather that the theory of the co-existence of man and extinct species is no new one, and that proofs in support of it are not wanting; but it has only been supported by incontestable evidence, at least as far as France is concerned, since the publication of the valuable works of M. Lartet on the bone caves of Périgord and upon the burial cave of Aurignac (Haute Garonne). It may even be said that the last remarkable monograph of this savant has become the starting point of all the

researches which have since been undertaken in France, in England, in Belgium, in Italy, and in Spain. I am far from wishing to underrate the value and importance of the work which has been done in the bone caves of neighbouring countries; but the caves of France, and especially those of southern France and of Périgord, have supplied the most convincing proofs in support of this theory of synchronism, which acquires every day a greater number of partisans. This is an important fact, which Lyell himself seems to have somewhat forgotten, but M. d'Archiac has taken care to claim the recognition of its great importance.

II. DESCRIPTION OF THE BONE CAVES.

The name of bone caves is given to the more or less extensive natural cavities which occur in the sedimentary rocks of almost every epoch, but especially in those of the cretaceous beds of the Jurassic Mountains, and which contain a variable number of bones of men or of animals, intermixed, as a rule, with articles of human workmanship. These cavities, usually complex, and very irregular in form, communicate with each other, sometimes by wide galleries, sometimes by winding passages, so narrow and so low that they can only be traversed on hands and knees. Varying considerably in length and height, they extend sometimes a distance of some miles in the interior of the strata in which they are concealed. Situated for the most part at a much higher level than existing watercourses, they communicate with the outer air by openings in the side of the mountain, by holes in the vaulted roof, or by a species of natural wells, into which in many cases those torrents fell which formerly bore along in their current the various matters now found in the caves. Hence come the evident marks of erosion which are almost always to be observed on their walls.[1]

As they hollowed out the valleys and gradually deepened their beds, the great rivers of the quaternary

[1] The cave of Duruthy, recently described by M. Louis Lartet, is hollowed in a bed of nummulitic chalk.

epoch, often swollen by heavy rains, bore away the rocks which closed the entrance of the caverns, and deposited within them the ossiferous sediment and the waterworn stones which are found there; we must therefore admit, with M. Ed. Dupont, first, that the openings of the caverns found on the slopes of the valleys took place at a date corresponding to their greater or less height above the present level of the river; secondly, that the fluviatile deposits with which they are partly filled are the more ancient, the higher they are raised above this same level.

These deposits usually consist of a reddish, or sometimes black sediment of sand or mud, containing bones of different kinds intermixed with sand, gravel, and waterworn pebbles, or with angular fragments broken off from the roof or walls of the cavity. The ossiferous sediment is usually disposed in layers; sometimes it forms a hard crust, intermixed with fragments of bone imbedded firmly in its mass, and it is then termed a bone breccia. Breccia of this nature nearly always occupy the lower part of the caverns and fill up their fissures.

A stalagmitic crust of varying thickness covers in many cases the sediment and the remains imbedded in it. Sometimes even the successive ossiferous deposits are separated from each other by as many layers of stalagmite as there are layers of sediment.[1] Other calcareous incrustations, known as stalactites and stalagmites, presenting the most varied and whimsical forms, often cover the floor, the walls, and the roof of the caverns, and give them that fantastic appearance which caused them formerly to be considered as the abode of fairies.

Occurring, as we have said, in the most various beds (chalk of the transition period, jurassic, cretaceous, nummulitic, and upper marine tertiary rocks), and in every country

[1] In certain Brazilian caves Lund has counted seven layers of ossiferous sediment, separated by as many layers of stalagmite; a certain proof that the bones therein contained were deposited at different and successive epochs. The same phenomenon was observed in a gallery of the cave of Brixham, near Torquay, and in certain caverns of France and Belgium. This clearly shows that the waters were introduced and withdrawn several times, and in the intervals the stalagmite was deposited.

on the earth, the bone caves present nearly everywhere the same general characters, but not the same contents. Thus while the most ancient caverns of the European continent contain in more or less abundance the bones of the *Ursus spelæus*, the *Hyæna spelæa*, the *Elephas primigenius*, the *Rhinoceros tichorhinus*, the *Cervus tarandus*, the *Megaceros hibernicus*, the *Bison europæus* or aurochs, &c., those of America contain, besides the monkeys peculiar to that continent, the remains of animals which recall, but in colossal proportions, certain species of *edentata* still living in the country. Such are the *megatherium*, the *mylodon*, the *megalonyx*, the *glyptodon*, &c.

Finally, in Australia, where the only indigenous mammals belong exclusively to the family of *marsupials* or *pouched animals*, we find marsupials of gigantic size in the bone caves (*Diprotodon australis*, *Macropus atlas*, *Phascolomys gigas*, &c.).

The condition of the bones imbedded in the sediment of the caves shows that they have undergone considerable changes in their chemical composition. They have generally lost the greater part of their organic matter. They are fragile, resonant, more or less friable, cracked, and stick to the tongue when they are touched with it. Many of them are irregularly broken across, or else intentionally split lengthways. As a rule, they are scattered without any order in the sediment of the caves, but sometimes they have retained their natural positions. This was the case with a femur, tibia, fibula, patella, and an astragalus of *Ursus spelæus*, found by Dr. Falconer in the cave of Brixham. The skeletons of the great mammalia (elephant, horse, ox, &c.) are very rarely found entire[1] in the ossiferous grottoes, while all the pieces of the skeleton of the reindeer and of animals of small or middling size are very often, indeed nearly always, to be found. This is owing to the fact that the troglodyte savages of our lands carried

[1] Among the rare examples of which we are speaking, we may instance the almost entire skeleton of a rhinoceros found in the ossiferous sediment of Dream Cave, in Derbyshire, an evident proof that when introduced into this subterranean cavern, it was still clothed with flesh, or at least that the bones were still connected by ligaments.

away entire to their subterraneous dwellings those victims of the chase whose weight was not too great, while they cut up on the hunting ground the larger booty, contenting themselves with bearing away the head and limbs to eat in the cavern.

So many different opinions have been put forward with respect to the means by which the bone caves were filled, that it appears impossible to reconcile them with each other. The supposition that all bone caves have been filled by watercourses in flood, which at different times have borne thither, in company with gravel, mud, and pebbles, the immense quantity of bones which they encountered on the surface of the soil, is, we think, a too absolute assertion, and one which observation has shown to be false. For often even the youngest and most fragile bones present no trace of a violent or prolonged removal; their sharpest edges, their most acute angles, are intact, which would certainly not be the case had they been carried any distance by the current.

Now this is precisely what has been observed in those caverns which contain only the remains of *Ursus spelæus*. We are therefore justified in ascribing the accumulation of these remains to the prolonged habitation of the bears in these caves, until the moment when they were overwhelmed by the waters, diluvian or other, and buried then and there in the sediment which they bore along with them.

Again, when we find in company with these bones of bears, and imbedded in the same sediment, those of herbivorous animals intermixed with those of the great *Felidæ* or of *Hyæna spelæa*, we ought to admit with the author of 'Reliquiæ Diluvianæ,' that these great carnivora may have carried their prey into these subterranean hollows, to devour it there at their leisure. The marks of the teeth of the carnivora still to be seen on the bones of the herbivora crushed by their powerful jaws; the presence of their excrement (*coprolithes*) in the very place of deposit; the heaps formed by these ejecta, still placed one over the other, and as if articulated together; are so many proofs which testify against the theory which assigns the

action of diluvian currents as the sole agent in the transport of organic remains into the bone caves.

The action of man himself should be seriously taken into consideration in seeking to determine the causes which have brought about the filling of the caves. For in many cases [1] they have served as dwellings, as refuges, as the rendezvous of hunters, as meeting places or tombs to the earliest populations of these districts. It is therefore not surprising that they should have left in them their mortal remains, the fragments of their daily meals, their weapons, their tools, in a word the still simple products of their dawning industry.

Unfortunately, we cannot always be sure that these objects are of the same date as the bones of extinct species with which they are found. Accidental disturbances of the soil, occurring at widely separated periods, may have mixed the productions of human industry with bones of a very different date. This is evidently the case in the cave of Fausan (Hérault), where Marcel de Serres found a fragment of enamelled glass embedded in a skull of *Ursus spelæus*; specimens of fire-baked pottery, relatively quite modern, were found at Bize by the same naturalist, side by side with other vessels of unbaked clay, and of far ruder workmanship. Similar facts, which may have occasioned many mistakes, have been observed in several other caves, among which it is sufficient for the moment to cite those of Herm and Aurignac.

We cannot therefore always, and as a matter of course, conclude that the human bones found in company with the remains of extinct animals were contemporary with each other. But doubt is no longer reasonable when the bones of animals and those of our own species, uniformly mixed, imbedded in the same sediment, and which have undergone the same alterations, are moreover covered by a thick layer of stalagmite; when objects of a completely primitive industry occupy the same bed with bones belonging to extinct species; when the latter bear the

[1] Some Italian caves were inhabited in the time of the Etruscans, and a few are still used in modern days.

evident marks of human workmanship; finally, when we find in the diluvian strata of the valleys, manufactured objects and bones exactly like those discovered in caves of the same date. Now all these circumstances occur together in the valleys of the Somme, the Rhine, the Thames, &c.; as well as in certain caves of France, England, Belgium, Italy, Sicily, &c.

All these bone caves cannot and must not, as we shall presently show, be referred to the same epoch. There are many far less ancient than those of which we have just spoken.

A considerable number of caves belong to the age of polished stone, among which those in the departments of Ariège, of Aveyron, of Lozère, of Gard, and of Marne, have acquired a certain notoriety. In most of these, especially in those which have been used as places of burial, human bones have been found in company with objects made by man, and with remains of animals belonging to species which are analogous to, or altogether the same as those of our time. MM. Garrigou and Filhol, who have carefully studied the caves in Ariège (*Niaux*, *Bedeilhac*, *Mas-d'Azil*, &c.) are of opinion that they are of the same date as the oldest lake dwellings of Switzerland.[1] We shall have occasion to recur to several of these caves in the course of this work.

'In spite of the opinion of certain geologists who are somewhat behind the age, the researches made in the caves, and likewise those of which the ancient alluvial deposits have been the theatre, clearly prove that man is prior to the events of which the diluvium was the product and the witness. Before that hour his foot pressed the soil which in the far distant future, now for us an obscure past, was to become the land of Gaul. He was the contemporary of the great annihilated quadrupeds. He saw, in our latitude, the primitive elephants wandering in virgin forests, the hippopotamus disporting itself in the rivers, the rhinoceros wallowing in the mud of the

[1] See F. Garrigou and H. Filhol, *Age de la pierre polie dans les cavernes des Pyrénées ariégeoises.*

marshes; he heard the roaring of the lion, and disputed his life with the terrible cave bear, and hunted those primitive oxen and stags the species of which are extinct.' ('Cosmos,' Journal Scientifique, 1867, p. 199.)

III. AGE OF THE CAVERNS.

M. Lartet is the author of the idea, at once natural and ingenious, that a kind of palæontologic chronology founded upon the gradual and successive disappearance of the great characteristic species of the quaternary epoch might be established for the bone caves of Europe. In following out this suggestion we find four principal divisions in the long period to which the bone caves belong, namely:

1. The age of the great cave bear (*Ursus spelæus*).
2. The age of the mammoth elephant (*Elephas primigenius*), and of the rhinoceros with partitioned nostrils (*Rhinoceros tichorhinus*).
3. The age of the reindeer (*Cervus tarandus*).
4. The age of the aurochs (*Bison Europæus*).

The first of these ages is characterised by the presence of the bear, usually accompanied by the hyena, and the great cat or cave lion; the *Ursus spelæus* did not, according to M. Lartet, survive this first period. The second epoch is distinguished by the disappearance of the mammoth, which became extinct, after having long had as almost inseparable companions the *Rhinoceros tichorhinus*, the great hippopotamus, and *Cervus megaceros*. In the third period the reindeer, which at first predominates, disappeared from central Europe and migrated further north. Lastly, in the fourth age, the aurochs, which still live among the Caucasus mountains and in the Lithuanian forests, is at the present day, with the reindeer, emigrated towards the North, the sole remaining representative in temperate Europe of those species which are reckoned characteristic of the quaternary period.

M. Dupont has proposed a classification of the caves which differs from that of M. Lartet. He holds that the oldest caves should be characterised by the presence of such animals as are completely extinct (*Mammoth*, *Ursus*

spelæus, *Felis spelæa*). To the second class would belong those caves in which are found the bones of those animals which have migrated (*reindeer*, *chamois*), but which survive to our own day. In a third and last group he would include those caves which contain the bones of species still living, or which have been destroyed by man. But as it nearly always happens in such cases, subsequent observations soon showed that these divisions were far too definite, the same cave often belonging to two and even to three consecutive ages.

For instance, Garrigou and Martin proved that the cave of Lourdes (Hautes Pyrénées), ranked by Milne-Edwards and Lartet in the age of the aurochs, should be ascribed to an earlier epoch, for it contains a quantity of reindeer bones, a species which disappeared, as we have already shown, considerably earlier than that of the aurochs.[1] In several caves of Sologne, the Marquis de Vibraye observed in the lowest layer of the diluvium (*grey diluvium*) bones of extinct species contemporary with the mammoth, together with flint tools of rude workmanship; the upper layer (*red diluvium*) contained, on the other hand, abundant remains of the reindeer intermixed with flints wrought with a degree of skill which testifies to the existence of a civilisation equal to that of the lake dwellers of Switzerland. Four successive ages have also been observed in the cave of Mas-d'Azil (Ariège).[2] The age of the reindeer and that of polished stone are equally represented in the cave of la Vache.[3]

'Thus we have,' says M. d'Archiac, 'in this single valley of Ariège, the elements of a human chronology which is nowhere else to be found in so complete a form in so limited a space.[4]

The Cave of the Fairies (Yonne), explored by M. de

[1] *Comptes rendus de l'Institut*, Mar. 2, 1864. *Age de l'aurochs et âge du renne dans la grotte de Lourdes.*

[2] Garrigou and Filhol, *Age de la pierre polie dans les cavernes des Pyrénées ariégeoises.*

[3] Dr. Garrigou, *Age du renne dans la grotte de la Vache, près de Tarascon (Ariège). Mémoire Soc. Hist. Nat. de Toulouse*, 1867, p. 58.

[4] D'Archiac, *Faune quaternaire*, p. 106, Paris, 1865.

Vibraye, is likewise an example of a cave where several successive ages are well represented. In the lowest layer are contained the remains of the great characteristic species of the diluvium (*Ursus spelæus*, *Hyæna spelæa*, &c.); in the middle layer are those of the reindeer; lastly, in the upper layer (*loess*) bones of animals still living in the district (fox, badger). Analogous facts have been remarked in the department of Hérault (cave of Pontil) by M. Gervais; in that of Aude (at Sallèles-Cabardès) by M. Filhol; in Poitou by MM. Brouillet and Meilles, &c.

Kent's Cavern, near Torquay, is another example which proves incontestably that the same bone cave may have been inhabited by man at different epochs. In a layer of red loam overlying the original soil of this cave are found bones of extinct or migrated animals (*Machairodus latidens*, *Ursus spelæus*, *Hyæna spelæa*, *Cervus tarandus*, &c.), intermixed with carved flints (some of the Saint-Acheul type, others resembling those of Aurignac, of Moustier, and of Laugerie Haute), and with implements of reindeer bone (harpoons and barbed arrows, awls, pins and needles), which resemble the delicate work of the troglodytes of la Madelaine (Dordogne).[1] The bed of red loam which contains these various objects is itself covered by a layer of stalagmite from one to three feet thick, and a third layer of dark muddy soil, from four to fifteen inches in depth, overlies the stalagmite.

'Above the stalagmite, and principally in the black mould, a number of relics have been found belonging to different periods, such as socketed celts, and a socketed knife of bronze, and some small fragments of roughly-smelted copper, about four hundred flint flakes, cores, and chips, a polishing stone, a ring of stone already described, numerous spindle-whorls, bone instruments terminating in comb-like ends, pottery, marine shells, numerous mam-

[1] Among the flint instruments discovered in Kent's Cavern are several which have the form of long splinters, similar to the splinters of obsidian with which the inhabitants of New Caledonia tip their javelins, and which those of Terra del Fuego use both for arrow heads and knives. The English flint knives in question are very like those of Laugerie Haute, but the workmanship is not so good

malian bones of existing species, and some human bones, on which it has been thought there are traces indicative of cannibalism. Some of the pottery is distinctly Roman in character, but many of the objects belong, no doubt, to pre-Roman times.'[1]

We cannot hesitate to conclude from this list, that subsequent to the deposit of the stratum of dark soil, Kent's Cavern was frequented by men of the age of bronze and of polished stone, without counting those of the Roman epoch who have left in the cave the traces of their industry. But it is equally incontestable that Kent's Cavern long served as a dwelling to the primæval inhabitants of the country, that they had their meals in it, and worked in flint and bone there, &c., until the day when the thick layer of stalagmite which covers the ossiferous sediment was formed. No other explanation would account for this strange admixture of bones of extinct species, of flints of the Saint-Acheul and Moustier types, of artistically wrought bone implements, contained in the same sediment.

Here then is a cave which contains incontestably *in situ*, according to the scientific men who have explored it, objects belonging to all ages, and which it is consequently impossible to rank in either of the too exclusive categories admitted or proposed by palæontologists. The caves of Hohefels in Wurtemberg and of Thayngen in Switzerland offer analogous and perhaps even more remarkable facts; for in the last especially were found an essentially northern fauna, and animals whose contemporaneity was far from being suspected.

The palæontological classification of caves is therefore liable to lead us into serious mistakes; and moreover it is often entirely local. Thus Louis Lartet himself was obliged to modify in almost every respect the chronology of his illustrious father, in determining the age of the Spanish caves which he had been exploring. Therefore

[1] Evans, *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain*, p. 445, 1872. In certain Italian caves (Grotta dell' Onda, Grotta de' Goti e della Giovannina) bones of *Ursus spelæus* have been found as well as tools of the neolithic age.

In 1867 Dr. Garrigou proposed to the Société d'Histoire Naturelle of Toulouse a new classification, which is generally adopted at the present day. It is as follows:—

1. The age of the *Ursus spelæus*, with which the author connects also the period of the mammoth.

2. The age of the *Cervus tarandus* (reindeer), comprising also that of the aurochs, and characterised in its latter half by the almost complete disappearance of the species of the first age indicated above.

3. The age of polished stone.

Like those which it was intended to reform, the classification of Dr. Garrigou is somewhat arbitrary; for we do not know with certainty the precise epoch at which the animals which characterise any given period appeared in our lands or disappeared from them. Moreover, these epochs sometimes overlap one another, like those of stone, bronze, and iron. We know, for instance, that the great cave bear and the mammoth often accompany the reindeer, even in those caves where the bones of the latter are far more numerous; that in certain caves (Solutré) the bones of the last-named animal were discovered along with those of the horse, predominant in its turn and perhaps already domesticated; finally that M. L. Lartet found carved and engraved reindeer bones in the cave of Duruthy, together with objects of industry which announced the dawn of the age of polished stone.

While recognising the defects we have mentioned, and taking as his point of departure the comparative degree of skill attained in the workmanship of the artificial products taken from the bone caves, M. de Mortillet proposed to class these implements as follows:—

1. The epoch of Saint-Acheul (Somme), distinguished by the almond-shaped axe, the axe in the form of a cat's tongue, and by the absence of bone implements.

2. The epoch of Moustier (Dordogne), distinguished by scrapers and triangular lance heads, cut only on one side.

3. The epoch of Solutré (Saône-et-Loire). The almond-shaped axes disappear; the flint spear heads are

more skilfully wrought. The principal weapon is an angular mace, which reappears in the following epoch.

4. The epoch of Aurignac (Haute Garonne). Bone implements are more frequent. The angular mace persists. The arrow and spear heads, instead of being flint, are fashioned in bone or from the antlers of the reindeer.

5. The fifth epoch is that of la Madelaine (Dordogne), distinguished from the preceding by the presence of numerous works of art carved or engraved upon stone or bone. The arrow and lance heads in bone or reindeer horn are, as at Aurignac, bevelled or pointed at their lower extremity so as to penetrate the shaft which is destined to carry them.

The above classification would be doubtless convenient, if it were in entire agreement with the facts. Unfortunately the testimony of facts tends to lessen its value. Thus the workmanship of Cro-Magnon, for instance, seems less advanced than that of la Madelaine, and yet M. de Mortillet confounds the two epochs. Moreover, judging from its tombs, its carved flints, and rude sculpture, we are inclined to place Solutré in an epoch intermediate between the ages of the reindeer and of polished stone. This cave would thus be more recent than la Madelaine, although it is ranked long before it by M. de Mortillet. However, on receipt of further information, M. de Mortillet subsequently modified his original classification, and we here reproduce an abridged form of his new table of the geological ages.

Ages	Periods
Neolithic, or of polished stone	Of Robenhausen. The lake dwellings and dolmens.
Palæolithic, or of chipped stone	Of la Madelaine. The majority of the bone caves; almost the whole of the reindeer epoch. Of Solutré. The reindeer and the mammoth. Of Moustier. The great cave bear. Of Saint-Acheul. The mammoth.
Eolithic, or of stone splintered by the action of fire	Of Thenay. Tertiary period.

However ingenious and convenient the industrial classification of M. de Mortillet may be, it is not even a purely artificial one, and more than one objection has already been raised against it on this head. For whatever he may maintain, the progress of industry is not sufficiently evident nor the differences sufficiently marked, between the types of Moustier and Saint-Acheul, to allow us to admit their regular succession in space and time. Numerous and precise observations made on the spot by M. d'Acy prove that one type is not placed above the other, and that the flints of the Moustier type are as abundant in the lower strata as in the upper, although, according to the theory of M. de Mortillet, they do not occur in the former and only appear higher up.

Taking into account at once the stratigraphical, palæontological, and archæological characters, and especially desirous to remove the doubts which some people still retain with respect to the authenticity or to the great age of the bones and works of art found in the caves, M. Hamy has endeavoured to establish, between the caves and the quaternary alluvium, a parallel which shows them to be often identical. Indeed it could hardly be otherwise, since in a great number of cases, the filling of the caves took place at the same time as the deposition of the alluvium in the valleys. There is therefore an agreement, and even synchronism, between these two series of facts, and the organic remains, as well as the products of human industry, are generally identical in the two kinds of deposit in question.

If then the fauna of the alluvium of the valleys and that of the sediment of the bone caves are similar, the proofs furnished by the one corroborate those given by the others, and by establishing a comparison we can draw our conclusions with certainty. Starting from these premises, which are undoubtedly correct, and always subordinating, as he says, the history of the caves to that of the alluvium, M. Hamy has divided the bone caves into five groups corresponding to as many places which serve as types of stratified alluvium.

The first group belongs to the period of transition between the upper pleiocene and quaternary strata. It comprises, on the one hand, the shelly and sandy beds (*crag*) of the counties of Norfolk and Suffolk, the submerged forests of England, and the caves of which Montreuil is the type; on the other, the caves of Wookey, Gower, Syracuse, of San Teodoro, &c., which were filled up at a date anterior to the second glacial period. The pleiocene and quaternary species here co-exist, but the latter become more and more abundant, while the former gradually disappear.[1] Flint implements exist, but they are more rudely fashioned than those of Abbeville.

The caves of the second group, of which Moustier, Hérm, and Nabrigas may be considered as the principal types, belong to the age of the mammoth. This group is characterised palæontologically by the simultaneous presence of extinct animals (cave bear, mammoth, &c.), those which have migrated (reindeer and hippopotamus), and those still extant in the country (horse, ox, &c.). Geologically it corresponds to the grey diluvium of Paris, that is, to the lowest layers of the fluviatile alluvium, to which M. Belgrand has given the name of *lower levels*. The corresponding typical beds are those of Hoxne, Saint-Acheul, Abbeville, Levallois, the valley of the Rhine, Clermont-sur-Ariège, Denise, &c. The skulls of Neanderthal, Lahr, Eguisheim, and of the Olmo; the jawbones of Moulin-Quignon, of Naulette, and of Arcy, belong to this age of the mammoth.

The third group forms a link between the ages of the mammoth and reindeer. The typical caves are those of Aurignac, Bize, Cro-Magnon, Engis, and the Trou du Sureau in Belgium. The stratified alluvium comprised

[1] An *Elephas meridionalis* was found at San Teodoro; and in the cave of Baume (Jura), which chronologically corresponds to the stratified deposits of Cromer and Montreuil, a *Machairodus latidens*, a pleiocene species of great bear, with long flattened canine teeth, serrated at the edges and curved backwards like a scimitar, was found in company with the *Hyæna spelæa* and the *Elephas primigenius*, animals which distinctly belong to the quaternary epoch.

in this group belongs to the mean levels of the Seine and to the deposits of which those of Grenelle and Var are types. The work in bone improves, and the shaping of the flint tools is simplified.

The fourth group includes the types of Eyzies, of la Madelaine, of Laugerie Haute; to which must be added the other caves of Périgord (excepting that of Cro-Magnon) as well as la Vache, Massat, Bruniquel, Trou Magrite, Pont à Lesse, and Solutré. M. Hamy ranks in this subdivision the beds of Boulonnais, of Schüssenried, and the high levels of the Seine (red diluvium and *loess*). This group corresponds to the first age of the reindeer.

The grotto of Chaleux and other caves of the valley of the Lesse (*trou du Frontal, trou des Nutons*), belonging to the second age of the reindeer, are comprised in the fifth group. With these are reckoned in France the caves of Lourdes, and those of la Balme and Béthénas in Dauphiné. The skulls of Furfooz belong to this epoch, which is distinguished from the preceding ones by a marked decadence in the work in flint and bone, which in the preceding epoch had shown a steady improvement.

At Eyzies and at Massat the first attempts at engraving on stone were discovered. At la Madelaine carving in bone begins, and at Laugerie Basse and at Bruniquel it attains its highest degree of perfection. A specimen of carving on stone was found at Solutré.

The data furnished at once by stratigraphy, palæontology, and prehistoric archæology, form the bases of the divisions proposed by M. Broca for the quaternary epoch, divisions which he has himself drawn up in the following table, which we have already given, p. 28.

	Stratigraphical Data	Palæontological Data	Archæological Data
Quaternary epoch	Low levels of undisturbed valleys	Age of the mammoth	The axe of Saint-Acheul (fig. 13–14)
	Mean levels	Intermediate age	Arrow head of Moustier (fig. 15–17)
	High levels	Age of the reindeer	Arrow head of Solutré (fig. 18)
Modern epoch	Recent beds[1]	Modern fauna	The polished axe (fig. 19)

Hence we see that M. Broca adopts the stratigraphical data established by M. Belgrand, and, that in determining the palæontological data, he admits, with M. Hamy, an intermediate age between that of the mammoth and of the reindeer, that is, an age corresponding to the middle of the quaternary epoch. At this period, several species contemporary with the mammoth had already disappeared; others were nearly extinct; while the reindeer, on the contrary, was becoming more common, since it was altogether predominant in the following age, to which it gives its name.

As for the data founded upon archæology, that is on the greater or less degree of perfection attained by the workmanship of stone during the archæolithic period, M. Broca reduces them to three principal ones, and characterises each representative type nearly in the same way as M. de Mortillet has done.

Finally, applying this classification to the caves of Périgord, he ranges them in the following chronological order:—

1. Moustier, the earliest of the caves in Dordogne.

2. Cro-Magnon, more recent than the preceding, but belonging equally to the intermediate age.

3. Laugerie Haute and Gorge-d'Enfer, on the right bank of the Vézère, already form part of the reindeer age.

[1] M. Broca justly remarks that though they are called *recent* as compared to the quaternary beds proper, the epithet is unsuited to them from the point of view of our modern chronology, since the lapse of several centuries was required for the formation of some of them.—(*Revue Scientifique*, Nov. 16, 1872.)

SAINT-ACHEUL TYPE.
FIG. 13. Front view.

AXE, CARVED ON BOTH SIDES.
FIG. 14. Side view.

MOUSTIER TYPE.
FIG. 15. Uncut surface.

LANCE HEAD CARVED ONLY ON ONE SIDE.
FIG. 16. Side view.

FIG. 17. Carved surface.

4. Laugerie Basse, Eyzies, and la Madelaine form a group which brings us down to the total disappearance of the reindeer from France, and consequently to the end of the quaternary epoch, succeeded by the modern or neolithic period.[1]

FIG. 18. SOLUTRÉ TYPE.
Lance head.

FIG. 19. POLISHED STONE AXE.
(After Lubbock. 'Prehistoric man.')

All these are doubtless laudable attempts, and they throw some light on a subject which still remains somewhat obscure; but each author has his own distinct system, and

[1] Some facts observed at Bruniquel, at Solutré, and in the cave of Duruthy, seem to indicate that the reindeer became extinct in France towards the beginning of the neolithic period.

it is difficult to decide to which to give the preference, not as being the most convenient, but the most correct.

However, it is undeniable that these essays are useful, since they connect the abundant facts of past ages, determine their chronological sequence, and in a word illustrate the history of quaternary man. Unfortunately, the classification drawn up by the authors of these various attempts, ingenious as they are, cannot always be pronounced strictly accurate, and they do not present that concord and harmony which is one of the distinguishing marks of truth. They may nevertheless be adopted provisionally until the progress of science, or the chances of the future, furnish us with a better guide.

IV. QUATERNARY FAUNA. INHABITANTS OF THE BONE CAVES.

At the beginning of the quaternary epoch the mastodon existed no longer, at least in Europe,[1] nor the *Elephas meridionalis* of the sand-pits of Saint-Prest. The *Hippopotamus major* and the *Rhinoceros Merkii* and *leptorhinus* of the pleiocene period were still living. But the quaternary fauna properly so called, is chiefly represented among us by the mammoth, the *Rhinoceros tichorhinus*, the cave bear, cave hyena, great cave lion, the Irish elk, &c., which ended by yielding place to the reindeer, to the glutton, the musk ox, the Saïga antelope, the chamois, the wild goat, and the marmoset, which at a later date migrated to other districts. We may add to this list nearly all the animals living at the present day, and which appear to be the more or less modified descendants of quaternary species. Of these then some are extinct; such as *Ursus spelæus*, *Hyæna spelæa*, *Felis spelæa*, *Elephas primigenius*, *Rhinoceros tichorhinus*, *Megaceros hibernicus*, to which we must add the *Machairodus cultridens* and *latidens* (R. Owen) found in certain caves of France and England. Other species still living; lemming, lagomys, glutton, arctic fox, reindeer, musk ox, have migrated towards the north of Europe, and even to America. Others,

[1] This animal lived in America during the quaternary period.

on the contrary have gained the east (Saïga antelope, hamster), or the south, or have no longer any kindred species except in the hottest regions of Africa and Asia (hippopotamus, elephant, lion, hyena).

Others have taken refuge on the summits of the Alps and Pyrenees (chamois, wild goat, marmoset) or have disappeared from our countries since the beginning of history; such for example is the urus (*Bos primigenius*), which in the time of Cæsar still inhabited the Hercynian forest and even the great woods of the Vosges and other parts of Lorraine (Godron).

Others have fled before man, their improvident destroyer. Of these are the aurochs (*Bison europœus*), restricted at the present day to the forests of Lithuania, with the exception, however, of a few scattered individuals recently found wild in the neighbourhood of the Caucasus; the lynx, which, according to Cuvier, has almost entirely disappeared from inhabited districts, but which is still to be found in the Pyrenees and even in Africa; the beaver, formerly very common among us, and now banished to the banks of the Rhine and the Danube, where it is only to be found in small numbers; the mouflon, which M. Bourguignat says he found in the cave of Vence in Provence, and which now exists only in the islands of Sardinia and Corsica. Others, finally, have remained in those same districts where we find at the present day the bones of their earliest ancestors: the wolf, the dog, the fox, the badger, the otter, the mole, the hedgehog, the common stag, the ox, the wild boar, the horse, &c.

Birds, reptiles, fishes, and molluscs, of similar or analogous species to those now existing, are also to be found in the caves of Europe; but these are in small number as compared to mammalia. With regard to fishes, M. Ed. Lartet has made an important observation: they are rare or common in proportion to the remote or recent date of the bone caves. For instance, in the caves of Aurignac (Haute Garonne), of Moustier, of Gorge d'Enfer (Dordogne), and of la Chaise (Charente), they are distinguished by the presence of the unbarbed arrow, and where not a single fishbone has

been hitherto discovered. We are left in uncertainty as to whether the earliest inhabitants of our lands were possessed of tackle sufficiently perfect to procure themselves an abundance of fish, or whether, as is highly improbable, they were in the habit of eating on the banks of the river the raw fish they had just caught. On the other hand, fish abound in caves of more recent date, where barbed arrows and harpoons are found, in la Madelaine, at Eyzies, at Bruniquel, &c.

The same remarks apply to birds, which are also less abundant where arrow heads with a double range of barbed points are wanting. This fact had been already noticed by M. Brun, before M. Ed. Lartet called attention to it. With regard to birds, only two species have become extinct in Europe since the quaternary epoch, and nearly in our own time, the grouse (*Tetrao urogallus*) and the great penguin (*Alca impennis*), which are no longer found in Denmark. But cases are numerous among the birds of the Isles of Bourbon and Mauritius, of Madagascar and New Zealand.[1]

No species, either among reptiles, fish, or invertebrate animals, has lately become extinct excepting the *Cyrena fluminalis*, which lived formerly in the Somme and the Thames, and which is now confined to the waters of the Nile and certain rivers of Asia.[2]

[1] The dinornis and the epyornis are two gigantic birds, something like the ostrich; the one found in the most recent strata of New Zealand, the other in the modern alluvium of the Isle of Madagascar. The height of the latter was about 16 feet, its eggs were equal in capacity to six ostrich eggs, to 148 hens' eggs, to 50,000 humming birds' eggs. One of them which I was enabled to see and measure at Toulouse had the following dimensions :—

	m.
Great diameter	1 ft. 8 in.
Little diameter	9 in.
Thickness of the shell	1 to 2 lines.

Finally, it could contain nearly 2 gallons of water. One of the eggs of the epyornis described by Saint-Hilaire was still larger. Hence we readily conceive that the Malagasy use them as provision vessels, and even, it is said, as saucepans. It is not quite certain that these birds are completely extinct. The dodo, nearly akin to our gallinaceous birds, was still extant in Mauritius in 1626.

[2] Certain crustacea (*Gammarus loricatus* and *Mysis relicta*), whose

All the species of mammalia which we have already named as occurring in the caves of Europe are not equally and uniformly distributed among them. In some the pachydermata and the great carnivora are predominant, especially the hyenas (*e.g.* Kirkdale in Lancashire, Lunel-viel in Hérault). Elsewhere (in the caves of Franconia, of Osselles, of Nabrigas, of Herm, &c.) the bears are more abundant, sometimes to the exclusion of all other species. In a great many districts (Bize, Pruniquel, la Madelaine, Eyzies), the reindeer predominates, nearly always accompanied by other ruminants of the genera *bos*, *cervus*, and *ovibos*, and even by the cave bear and other great pachydermata then gradually disappearing.

It was for a long time believed that the reindeer was only to be found in the bone caves. Recently discovered facts have proved this to be a mistake which it is important to correct. In a diluvian bed in the Thames valley, that of Acton, which resembles in all particulars that of the valley of the Somme, Colonel Lane Fox found the bones of *Cervus tarandus* intermixed with those of *Hippopotamus major*, of *Elephas primigenius*, of *Rhinoceros hæmitœchus*, of *Bos primigenius*, and of *Bison priscus*, in company with flint implements of the rudest workmanship. Some months after this discovery by Colonel Lane Fox, M. Chantre observed in the sediment of the Rhone basin a curious assemblage of species of the quaternary fauna, among which figured the *Cervus tarandus*. Finally, the bones of the reindeer were found at Schüssenried in Suabia on a moraine of an ancient Rhine glacier;[1] a new proof that this animal lived in

origin dates from the glacial period, are still extant in Sweden, in Lakes Wenner and Wetter. Moreover, recent soundings made on the coasts of Europe and America have raised from the bottom of the sea *terebratulæ* and sea urchins similar to those found in the chalk of the hill of Meudon, of the cliffs of the coast of England, and of the plains of Champagne.

[1] At Schüssenried reindeer bones were found on the moraine of an ancient Rhine glacier, in company with those of the glutton and of the arctic fox, with remains of mosses which are now only found in the most northern regions of Europe. The bones of this animal were so abundant in the above mentioned place that Professor Fraas was enabled, by making an anatomical selection among them, to reconstruct an entire skeleton, now in the museum at Stuttgard. Reindeer bones were also

Suabia during the glacial period, perhaps even during the interval which elapsed between the two glacial periods which have left their traces in Switzerland. Its existence in France long after the extinction of the great pachydermata, of which event moreover the exact date is entirely unknown to us, is rendered more than probable by the discovery of its bones intermixed with those of the horse and the ox in the caves of Béthenas and of la Balme in Dauphiné, and further by implements of the neolithic age, perhaps even of the age of bronze, found with these same bones at Bruniquel. As for the *Saïga*, M. Albert Gaudry has lately shown that this species of antelope lived in the reindeer age not only in Périgord but also in Angoumois, and that our ancestors fed upon the flesh of this beautiful animal.

In short, the quaternary fauna resembles our modern fauna, which is merely the continuation of it; but the former is richer, more varied, better nourished, and consequently more vigorous than ours. However, in spite of their greater size, the diluvian mammalia, like those of the tertiary rocks, had, it seems, a relatively small brain, and perhaps a shorter life than those of modern times.

We are struck by the strange association, especially in the quaternary fauna, often in an extremely narrow circle, of species so numerous and so distinct either in their habits or with regard to the geographical distribution of kindred species now extant. We shall shortly examine the cause of this phenomenon, which has long perplexed palæontologists, and which has lately found a satisfactory solution in the knowledge of the distribution of land and water in Europe at the time when these animals lived in Europe.

As an example of the singular assemblage of species of which we are speaking, we shall presently quote the list of those which, according to M. Merk, were found together in the Kesslerloch, in the neighbourhood of Thayngen. See p. 78.

found in abundance at Thayngen, and in the cave of Pont-du-Gard. This animal advanced, therefore, further towards the east of Europe than it was originally believed.—(*Revue Scientifique*, Jan. 11 and 25, 1873, pp. 665 and 712.)

PRINCIPAL MAMMALIA OF THE CAVES OF FRANCE, OR OF THE DILUVIUM.

Extinct or highly modified	Migrated	Extant in the districts where they are now found in a fossil state
Hyæna spelæa	Cape hyena	Bat (several species)
Felis spelæa	Aurochs	Shrew mouse
Elephas primigenius	Reindeer	Hedgehog
Ursus spelæus	Elk	Dormouse
Machairodus cultridens	Canadian stag	Water rat
Rhinoceros tichorhinus	Virginian stag	Common bear
Rhinoceros hæmitœchus	Lagomys	Badger
Equus lartetianus	Lemming	Wolf
Megaceros hibernicus	Spermophilus	
Urus		
Domestic Animals		
Dog	Marmoset	Fox
Horse	Chamois	Polecat
Ox	Wild goat	Weasel
Goat	Beaver	Marten
Sheep	Musk ox	Rabbit
Pig	Saïga	Hare
		Fallow deer
		Roe deer
		Red deer

FAUNA OF THE ENGLISH CAVES.

We think it desirable to give for the sake of comparison the list of animals and of the products of art found in Kent's Cavern, near Torquay. The following list, drawn up by Evans, is the enumeration of the species whose bones were found in the red loam underlying a thick layer of stalagmite.

Machairodus latidens	very rare
Felis leo, var. *spelæa*, cave lion . . .	abundant
Hyæna crocuta, var. *spelæa*, cave hyæna .	very abundant
Canis lupus, wolf	rare
Canis vulpes, var. *spelæus*, large fox . .	,,
Gulo luscus, glutton	very rare
Ursus spelæus, cave-bear	abundant
Ursus priscus = ferox, grizzly bear . .	,,
Ursus arctos, brown bear	scarce
Elephas primigenius, mammoth . . .	not very common

Rhinoceros tichorhinus, woolly rhinoceros	abundant
Equus caballus, horse	very abundant
Bos primigenius, urus	scarce
Bison priscus, bison	abundant
Cervus megaceros, Irish elk	not uncommon
Cervus elaphus (*Strongyloceros spelæus*, Owen), stag	abundant
Cervus tarandus, reindeer	„
Lepus timidus (var. *diluvianus*?) hare	rare
Lagomys spelæus, cave pika	very rare
Arvicola amphibius, water vole	rare
A. agrestis, field vole	„
A. pratensis, bank vole	very rare
Castor fiber, beaver	scarce [1]

Animals whose remains were found in the bed of black mould above the stalagmite.

Dog
Short-horn ox (*Bos longifrons*)
Roe deer
Sheep
Goat
Pig
Rabbit

That is, the fauna of the present day, accompanied by instruments of the polished stone and bronze ages.

In other bone caves of Great Britain, the following species have been found:

Rhinoceros hæmitœchus.
Rhinoceros megarhinus.
Elephas antiquus.
Cervus Guettardi (a variety of the reindeer).
Lemming.

In the diluvian gravel beds two molluscs occur which no longer exist in England (*Hydrobia marginata*, and *Corbicula fluminalis*).

Objects of Human Industry found in the Ossiferous Sediment.

Flint implements of the types of Saint-Acheul, of Aurignac, of Moustier, of Laugerie Haute; barbed har-

[1] Note the absence of *Ovibos moschatus*, or musk ox, both in the caves and diluvian gravel beds of England. The birds and fish found in Kent's Hole have not yet been determined. See Evans, *Ancient Stone Implements and Weapons of Great Britain*, pp. 462, 463.

poons and arrows, fish hooks, pins and needles of bone, nearly resembling similar objects found at la Madelain (Dordogne).

FAUNA OF THE CAVE OF KESSLERLOCH, NEAR THAYNGEN (SWITZERLAND), ACCORDING TO THE LIST OF M. MERK.

			Number of Specimens
Extinct animals		1. Cave lion	3
		2. Mammoth	4–6
		3. Rhinoceros	1–2
		4. Bear	1
Migrated animals	Towards the north	5. Reindeer	250
		6. Glutton	4
		7. Arctic fox	3
	Towards the Alps	8. Chamois	1
		9. Wild goat	1
		10. Alpine hare	500
		11. Marmoset	1
	Towards America	12. Wapiti	1
		13. Canis lagopus	40–60
	Towards the Alps	14. Lagoped	80
	To neighbouring countries	15. Aurochs	6
		16. Red deer	6
		17. Bear	2–3
		18. Lynx	3
		19. Wild cat	1
		20. Wolf	17
		21. Swan	1
		22. Wild goose	2
		23. Osprey	1
Animals	Still in the land	24. European fox	2–3
		25. Hare	2
		26. Crow	3
	Domesticated	27. Dog ?	1
		28. Horse	20

V. BONES OF WOUNDED ANIMALS FOUND IN THE CAVES.

If it be true that the wrought flints are works 'which no freak of nature, no agency but a human hand, guided by a human mind, could have produced' (A. Gaudry), we may say the same with still more certainty of the bones of extinct or migrated species which bear the unmistakeable marks of wounds made by man, or the no less evident trace of an industry which reveals an art, doubtless rude, but already animated by a lively sense of nature. We will consider the former in the first instance.

In his 'Recherches sur les Ossements Fossiles,' vol. iv. p. 396, Cuvier speaks of a head of cave hyena (of Gailenreuth) whose occiput had been fractured, and which had recovered from the wound; Marcel de Serres has observed a similar fracture on the skull of an *Hyœna spelœa* (of Lunel-viel), whose left parietal bone was cleft through the whole thickness of the bone, a wound produced, he thought, by the tooth of some other carnivorous animal.[1] But it seems more natural to attribute these wounds to some weapon (flint javelin, or arrow) thrown by man, for since the time at which these observations were made by the authors whom I have quoted, several authentic examples of this kind of wound have been noted by trustworthy observers. I myself excavated from the cave of Nabrigas,[2] in Lozère, a skull of *Ursus spelœus*, which presented a marked depression on the right frontal bone, and in the centre of this depression a circular hole, whose smooth and polished edges indicate that a wound made by some sharp projectile had begun to cicatrise. Supposing that a combat had taken place between this bear and one of its own kind, it is more than doubtful, in my opinion, that one of the canine teeth of the latter could have thus pierced and fractured one of the frontal bones, while the other left not the slightest trace upon the skull. The wound in question seems to me therefore to have been made by some missile thrown by a human hand.

Admiral Wauchope affirms that he has seen a stone hammer imbedded in the skull of an Irish elk (*Cervus megaceros*), and even several heads of other animals of the same species wounded in like manner. On an entire skeleton of *Bos urus* (the urus of Cæsar) dug in the presence of Nilsson from out a deep peat moss of Southern Scandinavia, he observed the first lumbar vertebra pierced from in front by a javelin armed with a flint head, which had been thrown with such force that the point had pene-

[1] Marcel de Serres, *Essai sur les cavernes à ossements*, p. 165. Paris, 1838.

[2] See N. Joly, *Note sur une nouvelle caverne à ossements (Lozère)*, in the *Bibliothèque Universelle de Genève* (1835.)

trated into the next vertebra, in which it remained imbedded.[1] Professor Steenstrup possessed, in his collection, fossil skulls of stags found in the kitchen middens, containing, incrusted in the bone, splinters of flint, doubtless broken off from some missile thrown by the hunter. Lastly, MM. Lartet and Christy have given an illustration in their interesting work on the caves of Périgord, of the vertebra of a young reindeer pierced by a flint arrow, which had remained in the wound (fig. 20).

The Toulouse Museum of Natural History possesses the lower maxillary of an *Ursus spelæus*, of which one

FIG. 20. VERTEBRA OF A REINDEER, WITH FLINT ARROW HEAD IMBEDDED IN THE BONE.
(After Ed. Lartet and Christy.)

branch, violently broken in two, resumed its functions after a complete cicatrisation. In what manner and on what food the animal lived during the necessarily very slow formation of the bone, it is impossible to say. That the wound in question was made by man seems extremely probable, we cannot say it is certain, since it is just possible that the animal may have broken its jawbone by falling from a rock.

As for the bones which bear the marks of regular incisions more or less deep, although they have sometimes

[1] Sven Nilsson, *The Primitive Inhabitants of Scandinavia*, p. 169, London, 1868.

given rise to strange mistakes, the bones of *halitherium* found at Pouancé for instance,[1] it is known that palæontologists set a high value on those of the pleiocene beds of Saint-Prest (*Elephas meridionalis*), of the quaternary deposits of the Somme valley (*Rhinoceros meridionalis*), or of the channel of the Ourcq (*Megaceros hibernicus*), not to mention the incisions made with a flint tool on a quantity of reindeer bones, with the evident purpose of cutting the tendons near to their root, in order to use them for sewing. All these facts prove nothing less than the certain existence of man at an epoch far anterior to all historical tradition.

We must not close this chapter without saying a few words about the fractured jawbones of the cave bear and lion, which M. Garrigou believes to have been used by man as defensive weapons. It seems more natural to attribute these fractures to a simpler cause than that which has been assigned. The dental canal of these maxillaries is enormous, and the disappearance of the dental nerve after they have been buried for a short time leaves a considerable hollow, and age and damp render the slightest shock sufficient to break the bone at its weakest point. This may account for the fracture, which is always in the same place, observed on the numerous jawbones of *Ursus spelæus* in the Natural History Museum of Toulouse. We give this explanation with the more confidence that our opinion on this point was shared at the session of the Congress of Bologna by Professor Steenstrup, of Copenhagen, a savant whose weight as an authority will certainly not be denied.

VI. ENTIRE HUMAN SKELETONS FOUND IN THE CAVES. WOUNDED HUMAN BONES. FRACTURED SKULLS.

Although the caves have at every epoch served as dwellings, and frequently also as burial places, entire

[1] It is now generally known that Sir Charles Lyell and many other palæontologists attribute to the teeth of the dog-fish (*carcharodon*) the supposed human incisions which have been observed by certain scientific men on the bones of the *halitherium* found in the shell marl of Pouancé.

human skeletons are rarely found in them. When this does occur, it generally shows that the corpse was buried in the fossil-bearing stratum long after its formation. M. Cartailhac, indeed, asserts that all the researches he has made justify him in declaring that every complete human skeleton found in the caves may be considered, *à priori*, as of later date than the fluviatile deposit in which it is contained.

This is, perhaps, too sweeping an assertion, but it should be remembered by those palæontologists who wish to avoid such mistakes as have been made, especially with regard to the human remains of Herm and Aurignac.

Schmerling, who has explored forty-eight Belgian caves, found human bones in only two or three of them. Lund, out of 800 Brazilian caves, which he examined, found only six containing human remains. These bones are always rather rare in the ossiferous caves belonging to the oldest stone age, but they become fairly common in the reindeer epoch, and still more so in the neolithic age.

If I am not mistaken, we possess hitherto only four or five authentic examples of the complete human skeleton, belonging undoubtedly to a very ancient epoch, the true palæolithic age. The first was discovered at Laugerie Basse (Dordogne) by MM. Massénat, Lalande, and Cartailhac, in a layer containing carved reindeer bones, an evidently undisturbed stratum, for it was covered with enormous blocks, detached from the rock which formed the vaulted roof of the shelter which served as a refuge to the troglodytes of the reindeer age, and which was preferred by them to other homes. The authors of this discovery rightly judged from these facts that they beheld the victim of a landslip, which occasionally took place at that remote epoch, as in our own day, and of which the traces still exist.

The skeleton of Laugerie Basse was lying on its side, and appeared to have originally been in a crouching posture. The left hand lay under the left parietal bone, the right upon the neck. The elbows fell nearly to the knees; one foot was close to the pelvis. The vertebral column had been

crushed by the corner of a great block, and the pelvis was broken; but all the bones retained their natural positions or were little removed from them. In a word, this skeleton presented exactly the appearance of a startled man, raising his hands to his head, and making himself suddenly as small as possible. Near the skeleton, and scattered in pairs, lay shells (*Cyprœa pyrum* and *Cyprœa lurida*) which had no doubt served to adorn some garment. Two pairs of these shells lay on the forehead, one pair nearly touching each humerus, four for the knees, and two at each foot.

The skeleton of Laugerie Basse is then a well authenticated example of human remains contemporary with the reindeer. Unfortunately, the authors of this important discovery have given us no detailed account of characteristics of the skeleton in question, which is so much the more to be regretted that it would have been of great interest to compare its skull with those of Bruniquel, of Furfooz, of Cro-Magnon, and with all those of the reindeer age, and even of earlier epochs.

Another entire skeleton, buried in the caves of the archæolithic epoch, was found on March 26, 1872, by M. Rivière, in one of the bone caves of Mentone,[1] at a depth of about twenty-one feet, along with numerous flint and bone implements,[2] marine and land shells, and bones of mammalia, among others of *Ursus spelœus*, *Hyœna spelœa*, *Felis antiqua*, &c. This skeleton was lying on the left side, in the attitude of a man whom death had overtaken during sleep. A number of perforated shells of *Nassa neritea*, and a few stag's teeth, also perforated, were scattered here and there upon the skull, and it is probable that these teeth and shells were formerly part of some head ornament; other shells of the same species, symmetrically

[1] In the cave of Cavillon, the fourth bone cave of the *baoussé rousse* (a patois word for red rocks).

[2] These instruments belong to three different types, those of Moustier, of la Madelaine, and of polished stone. There is therefore reason to suppose that several epochs at once are represented in these caves. In spite of several fractures the skull had preserved its form: it was dolichocephalous. The vertebral column, the ribs, and the bones of the limbs were nearly intact, and lay in their natural positions.

arranged, were probably also the ornaments of the dress. M. Rivière at the end of his report calls attention to the fact that the skeleton in question 'offers no characteristics which in any way proves it to be akin to monkeys, and that the human skulls which it most nearly resembles are those found at Cro-Magnon' (Périgord). Three other skeletons presenting the same characters as the above have since been found at Mentone.

If entire skeletons are rare in the caves of the palæolithic age, they are on the other hand fairly common in the burial caves of the neolithic period. As we shall have

FIG. 21. FEMALE SKULL OF CRO-MAGNON, WOUNDED IN THE FOREHEAD.
(After Louis Lartet.)

occasion to speak of these caves where we treat of the burial grounds, we need only mention this fact in passing.

When isolated human bones, more or less entire, are intermixed with the remains of extinct species, when it is certain that the stratum in which they are found has not been disturbed, we may assume with certainty that these bones are really contemporary with the deposit in which they are imbedded. But these cases of indisputable synchronism are rare (jawbones of Arcy, of la Naulette, &c.).

Another criterion of the great age of human remains

is furnished by the wounds made by stone weapons, of which some among them bear the marks or contain the fragments. Of this number is a human tibia found in the dolmen of Font Rial in Aveyron, which is pierced by a flint-headed arrow which had remained in the wound and had produced considerable exostosis. We may also cite as an example a female skull, discovered several years ago by M. Louis Lartet in the cave of Cro-Magnon, and of which the frontal bone showed a wound in process of healing, which was probably produced by a flint weapon (fig. 21).

The elder M. Lartet, in his remarkable work, 'Sur la coexistence de l'homme et des grands mammifères fossiles,' speaks of a Danish dolichocephalous skull of the stone age perforated by a lance-headed piece of the antler of an elk. Beside this skull lay thirty or forty skeletons also of a dolichocephalous race, and near them the stone weapons which the conquerors had used to slay their enemies.

Spring saw in the cave of Chauvaux, in Belgium, a human parietal bone in which the flint axe which had broken the victim's skull remained fixed. Nilsson, cited by Lubbock, says that in a tomb of the neolithic age attributed to Albus McGaldus, king of Scotland, a skeleton of extraordinary size was found in 1807, of which one arm had been almost separated from the trunk by a blow from an axe of diorite, of which a fragment still remained in the bone.

Lastly, M. Prunières discovered, in the caves of Baumes-Chaudes in Lozère, still more convincing proofs.[1] These are human bones which still contain the flint heads of the arrows which wounded them. Often too these flint arrow-heads are encased in a newly formed bony tissue, a clear proof that they had pierced the bone of the living subject and that the wounds had subsequently healed. M. Prunières has observed, moreover, that these flint arrow heads were not like those made by the inhabitants of the caves, but resembled those of the inhabitants of the

[1] See the *Bulletin de la Société d'Anthropologie de Paris*, p. 215, May 16, 1878.

neighbouring dolmens, to whom therefore these wounds must be attributed.

Undoubtedly one of the most curious discoveries which has been made of late years, is that of pierced or rather

FIG. 22. TREPANNED SKULL TAKEN FROM A DOLMEN, AND PRESENTED BY M. PRUNIERES TO THE MUSEUM OF THE INSTITUT ANTHROPOLOGIQUE.

(Half natural size.)

A B, Median line of the skull, passing the root of the nose at A, the crown of the head at C, the lambdoid suture at D, and the occiput at B; E, bone of the left eyebrow; F, bone of the right, fractured; *a b*, sickle-shaped edge of the surgical trepanning practised in childhood on the upper edge of the left parietal bone; *d c*, *b d*, edges of the posthumous trepanning. The suture, instead of following the median line C D, has been drawn considerably to the left.

trepanned human skulls, found by Dr. Prunières in the cave of *Homme-mort* in Lozère[1] and in several dolmens in the same department. Discs of bone, equal in size to the holes in the skulls have been found, sometimes within them, sometimes separately, lying beside them or at some distance. Many of these are pierced by one or two holes, so as to allow them to be strung upon a cord. Their diameter varies from that of a shilling to that of a crown-piece (see fig. 22). Some of them, more or less elliptical in shape, measure seven inches in length and five in their greatest width. M. Broca has made an exhaustive study of the subject,[2] which is, thanks to his labours, now very well known.

The trepanning was effected sometimes on the living subject, sometimes after death. An incision in the form of a T was first made on the skin under the hair, then the bone was scraped with a flint knife, until sooner or later the disc or discs of bone were detached from the skull; for sometimes two or three were taken from one individual even while living. It is a remarkable fact that the cases in which the operation, which is especially dangerous when we consider the poverty of the surgical apparatus of our ancestors of the stone age, proved fatal, are so rare that out of twenty skulls in the possession of Dr. Prunières, he has only observed one instance. All the others present unmistakeable traces of a complete recovery.

The motive of this operation has of course been sought, and the use of these discs found in the interior of the cranium or in the soil where the corpses had been buried. We shall return to this subject in the chapter on Religion. We shall see that the practice of trepanning persisted throughout the neolithic period, and that the use of these discs is the earliest proof of a belief in a future life.

The instances of human bones in the caves which were

[1] Artificially perforated skulls have also been found in the burial caves of la Marne, of Sordes, in the neighbourhood of Pau, in the ancient tombs of the Canary Isles, in the dolmens of Algeria, and even in Mexico and Peru.

[2] See the *Revue d'Anthropologie*, t. ii. p. 18, 1873, and t. vi. pp. 1 and 193 1877.

undoubtedly contemporary with extinct species are rare; we purposely repeat this fact, and the greatest circumspection is required before pronouncing on this kind of synchronism. Nothing is easier than to make the greatest mistakes on this point; the cautious M. Ed. Lartet himself assumed that the human bones of Aurignac were contemporary with those of *Ursus spelæus* and of the mammoth which he had himself found in the true archæolithic stratum of this cave, whereas, imbedded in a far more recent layer, overlying the former, they dated in reality from the neolithic age.

VII. PROOFS FURNISHED BY THE CONDITION OF THE BONES, AND THEIR CHEMICAL COMPOSITION.

When human bones are found buried in the same strata with those of extinct species, and when it is certain that the bed which contains them both is virgin and undisturbed soil, we may logically conclude, as we have said, that these remains of men and animals date from the same epoch. The similarity of appearance, and especially the equal quantity of animal matter which they still contain, duly considering, of course, the age and nature of the animal, give new weight to this conclusion. Now the quantity of ossein is easily deduced from that of the nitrogen discovered by chemical analysis. In this manner M. Delesse found that the proportion of nitrogen contained in the human bones found at Aurignac was very nearly the same as that in the bones of the bear, reindeer, and rhinoceros with which the remains of our own species were found associated in this burial cave. The numerous analyses of M. Scheurer-Kestner produced similar results, and led their author to believe with M. Delesse in the co-existence of man and the extinct species whose remains were under examination.

The nature of the bones, that of the soil, its dryness or humidity, its permeability by air and water, the more or less ancient date of burial, the depth at which they lie, &c., have a considerable effect on the condition of the bones, so that those most recently buried are not always

the best preserved. Hence M. Frémy has had no difficulty in proving that nothing is more variable[1] than the quantity of organic matter contained in fossil bones; some of them no longer contain any at all, others have a proportion of 8, 10, and even 20 per cent. Some strata have such a preserving power that M. Gimbernat was able to make an edible jelly from some bones of *Elephas primigenius*, and M. Bibra made a strong paste from the bones of *Ursus spelæus*. Mr. A. Milne-Edwards has seen a tooth of the last-named fossil species, found in the diluvium of the neighbourhood of Compiègne, which still contained sufficient ossein to retain its shape, after its calcareous substance had been expelled by the action of hydrochloric acid. Lastly, some bones of the mastodon found at New York, in 1845, still contained 27 to 30 per cent. of animal matter. With bones so well preserved it would then be possible to prepare an antediluvian broth, a real soup of *pre-adamite gelatine*. Who knows if this strange notion may not one day be realised by the unceasing progress of chemistry, which every day displays wonders far more surprising and of greater interest.[2]

The impossibility of determining by analysis the precise age of any bone, ancient or recent, will be easily seen from the foregoing statements. On the other hand, if the bones under examination, belonging partly to the human race, partly to extinct species, occupy the same bed and contain the same proportion of nitrogenous matter, we may admit with some degree of certainty the synchronism of the analysed remains. In this way M. Scheurer-Kestner satisfied himself that the skull of Eguisheim, for example, was of the same date as the bones of the mammoth and of the cave bear found along with it.[3]

[1] Marcel de Serres had long since observed that the chemical composition of the bones of the caves and that of the remains contained in the tertiary beds are sometimes absolutely identical.

[2] This strange idea, of which we have just spoken, was put in execution by German naturalists at the congress of Tübingen. 'They had the pleasure,' M. Babinet tells us, 'of eating, not a beefsteak, but a soup of mammoth gelatine.' See *Revue Scientifique*, 1866. Conference by M. Babinet on the *Glacial Period*.

[3] Scheurer-Kestner, *Recherches Chimiques sur les Ossements trouvés*

From all these facts we must conclude that if the chemical analysis of bones can, in certain cases, and by comparison, furnish useful data with respect to their relative ages, it cannot tell us anything about their absolute age. Hence again it results that if the doubts recently put forward with regard to the human bones of Aurignac have a real foundation, that is, if these bones are much less ancient than those of the cave bear, mammoth, and rhinoceros, considered as contemporaneous by M. Ed. Lartet, we must also conclude that the analysis of these bones made by M. Delesse does not prove all that which he wished it to show.

dans le lehm d'Eguisheim. Annales des Sciences Naturelles, t. vii. p. 165, 1867.

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CHAPTER IV.

THE PEAT MOSSES AND THE KITCHEN MIDDENS.

I. THE DANISH PEAT MOSSES.

It is well known that in certain regions (chiefly at the bottom of gently sloping valleys), and under the influence of certain conditions, aquatic plants, the *hypnum*, the *sphagnum*, &c., herbaceous land plants, heaths, and even forest trees, heaped up in shallow waters, become interlaced and partly decomposed, and produce a combustible of no great value. This combustible is peat. Denmark is especially rich in various kinds of peat beds, known in that country as *engmose* (meadow marshes), *lyngmose* (heath marshes), and *skovmose* (forest marshes).

The last alone deserve a few moments' attention, since they show that very different vegetations succeeded each other at different epochs in the soil of Denmark. Professor Steenstrup, who has made a special study of the subject, tells us that a layer of peat, composed of perfectly recognisable aquatic plants (*hypnum*), is placed above the amorphous, almost felt-like peat, which occupies the centre and bottom of the funnel-shaped basins in which it was formed. Stunted pines, heaped one over the other, still occupy the place in the marsh where they grew in the remote past. Then the *sphagnum* takes the place of the *hypnum*, and the heath appears, along with whortleberries, birches, hazels, and alders. Lastly, the Scotch fir, which once grew along the borders of the moss, but which has long since disappeared from the land, appears in great abundance, and principally on the outer belt. These trees now lie overturned in such a way that their roots are turned towards the edge of the basin and their tops towards the

centre; they are heaped upon each other and overlap with such regularity, that they present the appearance of piles of timber artificially arranged.

By degrees they disappear and are replaced by the sessile-leaved oak (*Quercus robur sessilifolia* of Smith), which in its turn gives place to the pedunculate leaved oak (*Quercus pedunculata*, Eberhard), almost the only one now existing in Denmark. Finally the beech appears (*Fagus sylvestris*), which at the present day grows so luxuriantly in this part of Scandinavia, that these forests are reckoned the finest in the world.

What causes brought about these changes in the vegetation? Judging from the shells of the peat mosses, whose species are identical with those actually existing in that region, the climate does not appear to have undergone any great modifications of temperature. Hence Steenstrup has been led to believe that the succession of the fir, the sessile-leaved oak, and the beech is simply due to a gradual desiccation and improvement of the soil, the fir thriving in poor and marshy, while the beech grows only in dry and fertile districts.

The series of layers of peat which we have just described extends to a depth of not less than 15 to 20 ft., and this argues the lapse of a great period of time between their origin and the moment at which their formation ceased. Ten to twelve thousand years perhaps, according to Steenstrup, went to the accumulation and transformation of these remains of a vegetation which has partly or wholly disappeared from the district.

The traces of fire still to be seen upon some of the pine trunks, and the presence of carved flints in the layer of peat formed by the same substance, are facts brought forward by the famous professor of Copenhagen in support of his assertion, that man existed at the period when dense pine forests covered Denmark with their sombre but rich vegetation. Other facts, not less convincing, corroborate the deductions of the learned Danish professor. He drew out, with his own hands, an axe which had been violently driven into the trunk of a Scotch fir (*Pinus sylvestris*). Now

this tree is no longer, and has never been since historic times, indigenous to the Danish isles, and has not thriven when the attempt has been made to re-introduce it.

It has also been proved by Steenstrup in a most ingenious and conclusive way that the *Bos primigenius* was contemporary with the ancient Danish forests. In a forest peat moss of the island of Mœn, he discovered an entire skeleton of this primitive ox, buried, so to speak, in a shroud of the needles of the Scotch fir. Needles of the same trees, slightly crushed, and in small fragments, constituted a blackish mass, placed within the space occupied by the skeleton, which mass is nothing else than the perfectly recognisable excrements of the ruminant, which lived and browsed in the Danish forests together with the blackcock, which has long since disappeared from them.

Two bones of the stag, found in the peat mosses of Jutland and Finland, where the Scotch fir is very abundant, have led the Danish savant to the same conclusion with regard to the animals to which these bones belonged. Steenstrup has further concluded from the presence of flint arrow heads in these bones, and arrow heads which had during the life of the animal been covered by a new formation of bone, that man had pursued and wounded the stags, but had not been able to kill them. He was therefore contemporary with them, and consequently with the pine forests of Denmark.

The stone age terminates with these forests. That of bronze saw the birth of the first oak of the peat mosses (*Quercus robur sessilifolia*); for it is in a layer of this oak that the magnificent bronze shields which now adorn the Museum at Copenhagen were found. Lastly, the historic, or iron age, belongs essentially to the epoch of the beech. No human bones have as yet been found in the Danish peat mosses. 'Who will tell us,' exclaims Virchow, 'how long this *calendar of trees*, if I may be allowed the expression, has been established; how many centuries have elapsed since the pine forests ceased to spread their dark verdure over the surface of these marshes? We do not know, but we know that with the

disappearance of the pines the blackcock also was forced to quit Denmark, for it fed upon their young shoots in the spring. If doubt were still entertained as to the *coincidence of the age of the pines and the stone age*, the discovery of a flint implement in the peat at the foot of such a pine would be a conclusive fact.'[1]

We must not leave the peat mosses of Denmark without mentioning the numerous necklace beads and earrings of amber which were dug out of those of Jutland. One of them furnished, it is said, more than 4,000 such beads, enclosed in a wooden casket, which has suggested the idea that this was the stock in trade of some jeweller of the neolithic age.

The Irish bogs have furnished palæontology with remains of the *Megaceros hibernicus* in a perfect state of preservation, and several museums, especially that of Toulouse, possess a complete and well mounted skeleton of this animal, which was the contemporary of the mammoth and the cave bear.

Among the French peat mosses we may mention in particular those situated near the mouth of the Somme, from some of which M. Boucher de Perthes extracted rough-hewn axes, and bones of the Irish elk, and from others a quantity of bone and flint implements (stag's horn axes with wooden handles, flint knives, bone fishhooks, necklaces, &c.), which undoubtedly belong to the age of polished stone. The proofs of the great antiquity of man furnished by the peat mosses of the Somme valley are less striking than those of the Danish bogs, but they have their value. Boucher de Perthes tells us moreover that in several districts in the neighbourhood of Abbeville, where an immense forest formerly stood, alders and oaks twelve feet in diameter may be laid bare by digging through the layer of peat formed subsequently above them. Some of these are still standing, others are uprooted and lie with their heads towards the source of the river. The renowned antiquary surmises that these

[1] Virchow, *Les tumuli et les habitations lacustres* (*Revue des cours scientifiques*, 4e année, 1866, p. 7).

trees were overthrown by a gust of wind from the sea, or by a tidal wave of more than ordinary force, the same perhaps which swept away the isthmus which formerly united Great Britain and the Continent.[1]

Whatever we may think of this last hypothesis, it is certainly true that these trees have fallen on the very spot where they grew, and that since they fell, great beds of peat not less than 5 or 6 yards in depth, have been formed above them. This peat is covered by a bed of waterworn pebbles to a depth of 12 or 16 inches. Now in the lowest layer, half-polished axes, along with bones of oxen, boars, roebucks, and stags, have been found. The conclusion is easy to draw.

The peat mosses of the neighbourhood of Paris belong for the most part to the same epoch. Some few among them seem, however, to date from the reindeer age. In the latter, which are formed of a fibrous peat, MM. Roujou and Julien found hearthstones, flint implements, and even pottery, which they believe to be of later date than the period of the mammoth, but more ancient than the age of polished stone. However, we must not forget that, by reason of their greater permeability, especially when they are in a soft condition, the peat mosses may have received and covered bones and products of human industry which it would be a mistake to regard in every case as contemporaries, merely from the fact that they occupy the same level. Many mistakes have been committed in this respect, and it is impossible to be too cautious in pronouncing upon the real age of any object found in the peat. But when Boucher de Perthes and Steenstrup have searched these bogs with the attention and care for which they are so justly celebrated, the results have great value, and give the most convincing evidence in favour of the thesis which we are endeavouring to establish; namely, the great antiquity of the human race.

[1] Boucher de Perthes, *De l'homme Antédiluvien*, p. 18.

II. THE PEAT MOSSES OF SWITZERLAND. LEAF-MARKED COAL OF MORCHWEILL, OF WETZIKON, OF UTZNACH, AND OF DURNTEN.

We cannot leave unnoticed the peat mosses containing leaf-impressed coal which occur in various parts of Switzerland, notably at Wetzikon in the east of Switzerland, at Morchweill near Saint Gall, at Utznach, and at Dürnten in Oberberg. These masses of carbon, of which the mean thickness is a yard, and which in certain districts attain to a depth of 4½ yards, are traversed by veins of clay, and they rest upon a bed subsequently formed of dirty white or yellowish clay. The shells of freshwater molluscs still existing in the country have been found imbedded in this layer (*Anodonta, valvata depressa, obtusa*, &c.). The trunks of pines are also abundant, overthrown in every direction, with their roots, their bark, and fibrous tissue with its concentric layers, showing that some of them were more than a century old, in a perfect state of preservation. These trees are much flattened, and encased in a blackish or brownish substance produced by the decaying of herbaceous plants. The trees are rarer in the upper layers, which are principally composed of compressed masses of carbon interlaced with roots and reeds.

Twenty-four species of plants, of which eight are trees or shrubs, have been discovered by Heer in these peat-bogs of the ancient world. We give the list of them:—

Trees

Common fir (*Pinus abies*).
Scotch fir (*Pinus sylvestris*).
Mountain pine (*Pinus montana*).
Larch (*Pinus larix*).
Yew (*Taxus baccata*).
Birch (*Betula alba*).
Oak (*Quercus robur*).
Maple (*Acer pseudoplatanus*)
Hazel (*Corylus avellana*).

Herbaceous Plants

Marsh trefoil (*Menyanthes trifoliata*).
Common reed (*Phragmites communis*).
Raspberry (*Rubus idæus*).
Perforated myrtle (*Vaccinium vitis idæa*).
Lake scirpus (*Scirpus lacustris*).
Several species of *sphagnum*.
Mosses, among others *Hypnum dilwii*, found at Thonon by M. Morlot among other glacial remains.

Only one plant of this epoch seems to have disappeared, namely, a species of *nuphar*, of which M. Gaspary has made a separate genus, under the name of *holopleura*.

ANIMALS WHICH OCCUR IN THE LEAF-MARKED COAL.

Mammalia		Insects	
Elephas antiquus *Rhinoceros etruscus* *Bos primigenius* *Ursus spelæus*	Extinct species	*Donacia discolor* *D. sericea*	Existing species

Molluscs

Anodonta *Valvata depressa* *Valvata obtusa* *Iridium obliquum*	Existing species

At Dürnten and at Utznach we find trunks of firs and birches a foot in diameter, with well preserved cones. At Morchweill an acorn still retaining its cup was found, and two varieties of hazel nut, of which one resembled the modern kind. Lastly, among the animals whose remains have been found in these beds, the most ancient species of the diluvium of the valleys occur, such as *Elephas antiquus*, *Rhinoceros etruscus*, *Bos primigenius*, and *Ursus spelæus*, contemporaries of the man of the caves. We find with these species, long since extinct, the elytra of insects belonging to species identical with those which still exist on the shores of the Swiss lakes (*Donacia discolor* and *D. sericea*).

According to Oswald Heer, one of these peat mosses, that of Morchweill, and perhaps that of Wetzikon, is placed between two beds containing striated erratic blocks, which seems to show that they were formed in the interval which separates the two glacial periods admitted by some geologists and rejected by others. Whichever opinion is adopted, it is at any rate true and incontestible that these masses of leaf-impressed carbon are covered by a glacial deposit. They belong therefore to an extremely remote epoch, and are at least contemporary with the ancient Rhine alluvium, above which the *lehm* or *loess* was deposited at the epoch of the great extension of the glaciers of the

Swiss Alps and of the Vosges, now extinct. Now, it is in this *loess*, at Eguisheim in Alsace, and at Lahr in Baden, that MM. Faudel and Ami Boué found human bones of which we shall soon have occasion to speak, a conclusive proof that man existed during the glacial period, that is, at an epoch when the woolly elephant, the rhinoceros, and the reindeer existed in our land.

III. THE KITCHEN MIDDENS OR SHELL MOUNDS.

The remains of prehistoric cookery, which are found in considerable heaps on the seashore, are known as kitchen middens to Scandinavian archæologists. These heaps are principally composed of oyster shells (*Ostrea edulis*), of mussel shells (*Mytilus edulis*), of limpets (*Cardium edule*), and of periwinkles (*Littorina littorea*). Bones of mammalia, of birds and fishes, are found together with these molluscs, and other similar refuse.

The principal mammalia are the stag (*Cervus elephas*), the wild goat (*C. capreolus*), and the wild boar (*Sus scrofa*). The reindeer is rarely found; but according to Steenstrup, it does occur in the kitchen middens, though its presence was long disputed. We must add to these about fifteen other species which are far less common than those already mentioned. These are the brown bear, the dog, the wolf, the fox, the cat, the lynx, the marten, the otter, the seal, the walrus, the beaver, the water rat, and the mouse. Birds are represented by the wild swan (*Cygnus musicus*), the blackcock (*Tetrao urogallus*), and the great penguin (*Alca impennis*), now nearly extinct. The fishes which occur most frequently are the herring (*Clupea harengus*), the cod (*Gadus cellarius*), the dab (*Pleuronectes limanda*), and the eel (*Muræna anguilla*). It is worthy of remark that none of these animals belong to an extinct fauna.

As for the kitchen débris themselves, they form heaps from 1 to 3 yards in height, by 100 to 350 yards long and 50 to 70 wide, and there are more than fifty of them, all situated a short distance from the shores of the Baltic, and seldom raised more than three yards above the level

of the sea. Among the refuse still remain the coal cinders of ancient hearths, rude pottery, numerous flint implements, and some few traces of stag's horn. But there is no vestige of metals, nor of cereals, nor, consequently, of agriculture. The dog was, however, already domesticated, as Professor Steenstrup has proved in a most ingenious way. He had observed that nearly all the long bones of mammalia and birds taken from the refuse heaps were reduced to their shaft or *diaphysis*. The heads or extremities had disappeared or were very irregularly broken. Moreover, Steenstrup remarked that the long bones were from twenty to twenty-five times more numerous than the short bones. Struck by these two facts, he shut up several dogs and gave them bones to gnaw. They devoured the short bones, gnawed the heads of the long bones, and left the shafts in precisely the same condition as those of Copenhagen. Hence the learned professor concluded that the Danish aborigines were in possession of a domestic animal, the dog, which accompanied them everywhere, shared their repasts, and served itself as food to these still barbarous tribes.

As for the bones of the other mammalia, they bear evident traces of having been purposely fractured by man, who broke them in order to extract the marrow which they contained for food.

As zoological museums of ancient times, and as links between the past and the present, the kitchen middens furnish Danish men of science with valuable data respecting the fauna of the country which their labours have rendered famous. Thus at the time when the use of metals was still unknown to their ancestors but when they were already in possession of better flint tools than those found in the diluvium of Abbeville and in certain caves of prehistoric times, the mammoth, the woolly rhinoceros, the musk ox, &c., no longer existed in Denmark. The oyster, at that time very common on the shores of the Baltic, has in several districts completely disappeared, and in the places where it is still found it is comparatively small and stunted. This is also the case

with the other edible molluscs before mentioned. This result is attributed to a perceptible decrease of saltness which has taken place in the waters of the Baltic, owing

FIGS. 23, 24. LANCE HEADS FROM THE KITCHEN MIDDENS.
(After Lubbock.)

to the great quantity of fresh water poured into this inland sea by the rivers of the present day, and to the obstruction of the channel of communication between the North Sea and the Kattegat caused by the formation of the land added to Jutland.

The presence of the bones of the blackcock in these refuse heaps proves that this bird, now extinct in Denmark, found the resinous buds which form its favourite food in the pine forests which grew near the coast. The great penguin (*Alca impennis*, Linnæus), now, according to some authorities, confined to the most inaccessible rocks of Iceland and Greenland, or, as others say, entirely extinct, was then common upon these shores. Its oily flesh was not despised; its fat was used at once for food, fuel, and light.[1] The refuse heaps contain no remains of the domestic fowl.

As a sporting, and especially as a fishing people, the ancient Danes have left in their kitchen middens a quantity of the remains of eels, cod, flounders, and herrings; all deep sea fish, in search of which they were obliged to venture far out to sea in boats formed of the trunk of a tree hollowed by flints and fire: a terrible struggle for existence, in which many human victims fell, but in which dangerous school many bold spirits were formed.

Human remains have hitherto been sought in vain in the kitchen middens; but as we have already said, a number of flint implements have been found there, some of which are rudely fashioned and resemble those of the diluvium (figs. 23 and 24); others, less common than the former, are of better workmanship and are even polished by the grindstone, for example some axes of a peculiar character, flat on one side and more or less convex on the other, and of which the object is confessedly unknown to M. Steenstrup (figs. 25, 26, and 27). Certain savage tribes of modern times make similar axes (figs. 28, 29, 30).

According to calculations of which we do not guarantee the accuracy, the kitchen middens of Denmark are about 7,000 years old, and are contemporary with the earliest lake dwellings. Steenstrup believes them to be of the same age as the dolmens, and believes that the people

[1] By placing a wick of any kind, moss for instance, in the stomach of a penguin, an economical lamp was obtained. In the middle ages the fat of this bird was used as fuel in the place of wood on the coasts of Newfoundland.

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AXE OF THE KITCHEN MIDDENS (after Lubbock).

FIG. 25. Convex face. FIG. 26. Side view. FIG. 27. Flat face.

MODERN NEW ZEALAND AXE IN THE BRITISH MUSEUM. (After Lubbock 'Prehistoric Man.')

FIG. 28. Convex face. FIG. 29. Side view. FIG. 30. Flat face.

who raised these great stone monuments, and those who have left the refuse of their meals in the kitchen middens, are one and the same. Worsaë, de Quatrefages, and Desor do not share this opinion. According to the famous Danish archæologist, the refuse heaps represent in the north the beginning of the age of splintered stone, while the dolmens belong to the end of it. M. de Quatrefages, again grounding his belief upon the fact that the remains of the industry of the people who formed the shell mounds are never found with the remains of *Elephas primigenius*, nor even with those of the reindeer (although, as we have seen, Steenstrup affirms that the latter do occur in the refuse heaps), concludes that the construction of the kitchen middens is of a much later date than the race of Anrignac and of Moulin-Quignon; he adds that, 'between the stone age of our earliest ancestors and that of the primitive Danes a whole geological period intervenes.' M. Desor, for his part also, denies the identity of the people of the kitchen middens with that of the dolmens, for, independently of the numerous domestic animals to be met with in the latter, objects in bronze and even in iron occur also, which are never found in the kitchen middens. It is therefore more than doubtful whether these two kinds of monuments date from the same epoch; we may even go so far as to say that the problem is now solved; the dolmens, and especially those in which iron and bronze occur, being proved to be far more recent than the kitchen middens of Denmark.

Blackish ashes have been found in the latter, which chemical analysis has shown to contain a considerable proportion of manganese; these ashes were produced by the combustion of a species of sea-weed (*Zostera marina*) sprinkled with sea-water. This double process resulted in a sort of saline efflorescence (the *sal nigrum* of Pliny).

Bones and antlers of the stag carved into fish-hooks, chisels, axe blades, &c., have been found among the débris. A sort of bone comb was discovered at Meilgaard, destined probably to split the tendons then used as thread and cordage. The remains of Danish cooking seem to show

that the tribes who formed one layer after another in such a way that they bear a certain resemblance to geological strata, lived under the shelter of tents, and practised hunting and fishing, eating their spoils on the spot.

Refuse heaps of still earlier date than those of Denmark have been observed in Suabia at Schüssenried. Others occur in certain caves of France, Belgium, in the Orkney Isles, in Scotland, England, &c. We may mention among others the cave at Brixham, where, associated with fragments of rude pottery and bones of extinct species, heaps of oyster shells and other saltwater molluscs occur, as well as fishbones of the genus *scarus*.

Cook observed débris of a similar character at Cape Leveque, in Australia. Lastly, Darwin and Lyell mention others in Guinea, and on the coasts of New Finland. They have even been found in America; in the States of Maine, Florida, Massachusetts, &c. Those of America are of two kinds, some containing marine shells in abundance, the others, situated in the interior of the continent, especially on the banks of the Mississippi and the St. John rivers, contain only freshwater molluscs (*unio, paludina, ampullaria*). In all of them occur axes, arrow heads and flint knives simply splintered, rude pottery, but never metal. The fauna excavated from them differs in no respect from that of the present day. Everything in these refuse heaps indicates a civilisation similar to that of the people who formed the Danish shell mounds, but not perhaps of such remote antiquity.

LIBRARY OF THE ROMAN BRANCH OF THE CATHOLIC

CHAPTER V.

THE LAKE DWELLINGS AND THE NURAGHI.

I. THE LAKE DWELLINGS OF SWITZERLAND.

It was during the winter of 1853-54, at an epoch when the waters of the lake of Zurich had fallen to the lowest level they are ever known to have attained, that Keller observed near Obermeilen the first piles, which led to so many important discoveries and such remarkable strides in the science of archæology.

Anyone may have observed in the Paris Exhibition of 1867, in the galleries devoted to Natural Science, those curious specimens which displayed before our eyes the dawning arts, industry, agricultural labours, and domestic life of the first inhabitants of Helvetia.

If we read the successive reports communicated by Keller to the Antiquarian Society of Zurich; Troyon's book on the lake dwellings, which Carl Vogt styles somewhat severely an *historical romance*, a *pious fancy*; lastly, the work on the lake dwellings of Neufchâtel, published by M. Desor, in 1865; if we add to these works the general views of Morlot on archæology, several critical articles of Pictet on fossil man, independently of what he has said in his great treatise on palæontology; the 'Crania Helvetica' of His, the studies of Rütimeyer on the fossil fauna of Switzerland, the 'Crania Germaniæ Meridionalis Orientalis' of Ecker, the 'Vorlesungen über den Menschen, seine Stellung in der Schöpfung und in der Geschichte der Erde,' by Carl Vogt, the 'Pfahlbaualterthümer von Moosseedorf,' by Jahn and Uhlmann, &c., we shall be convinced that love of science, allied to the noblest patriotism, could alone have brought to light so many

interesting discoveries in so short a time and in so limited a space of ground. The following details are taken from these original sources and from personal recollection.

It has been justly remarked that the lake dwellings of Switzerland are at the same time monuments of prehistoric architecture, a zoological museum, and a gallery of anthropology. Framework and piles, remains of wild and domestic animals, various forms of human skulls, implements of

FIG. 31. ANCIENT SWISS LAKE DWELLINGS, IN PART RESTORED BY COMPARISON WITH THE LAKE HUTS OF MODERN SAVAGES IN NEW GUINEA.

every description in bone, flint, bronze, and iron, pottery of more or less artistic workmanship, objects of art and ornament, woven stuffs, grinding stones, millstones for crushing, grains, bread, fruits, ashes, coal, &c., all these are found therein, or at least were found there in a state of confusion, which the science of antiquaries and palæontologists has reduced to the most perfect order (fig. 31).

Long known to the fishermen, who often entangled their nets in them, the piles of the Swiss lakes only at-

tracted the attention of scientific men about 1853. Keller was one of the first to understand their importance, and the reports which from that time (1854) he continually laid before the Antiquarian Society of Zurich bear witness to the zeal, conscientiousness, and power of observation which he has displayed in the production of a work worthy of his country and of himself.

By the help of the ruins which remain beneath the waters, let us endeavour to reconstruct in imagination these ancient dwellings, which a well-known savant, for once mistaken, asserted to have been built and inhabited by beavers. Imagine a number of piles,[1] fifteen to thirty feet long, with a diameter of three to nine inches, standing about four to six feet above the surface of the water when it is still. The distance between these piles varies; some of them are arranged at right angles to the shore, others are parallel to it, and form altogether a rectangle or a circle.

Usually fixed in the mud of the lake above the surface of which they are raised, they are sometimes supported (when the nature of the soil does not allow them to be imbedded in it) by heaps of stones, or *Steinbergen*, arranged round their base. Suppose these piles to be joined by transverse beams, held in their places by wooden pins. It then only remains to establish a kind of platform destined to support the hut and constructed of thick planks or of split trunks of trees roughly squared, and bound together by strong cords, wooden pins, or even by cross pieces of wood and by dovetailing. Finally, suppose that oval, circular, or rectangular huts are built upon this platform, ten, fifteen, or even twenty-seven feet in diameter, of which the walls are formed of perpendicular posts, bound together by wattled branches lined with a cement of clay. Each hut is covered by a roof of bark, thatch, cane, reed, fern, or moss; a door is left for the entrance, and a trapdoor within communicates with the lake. The trunk of a tree serves for seat and table, a heap of moss

[1] More than 40,000 were counted at Wangen, and about 100,000 at Robenhausen.

for a bed. Lastly, suppose each hut surrounded by a ring of piles, of which the upper end touches the surface of the water, to prevent the approach of hostile canoes, and united to the shore by a drawbridge, and a sufficiently exact idea will be obtained of the lake dwellings which in prehistoric times existed in Switzerland and elsewhere. The number of these habitations at present known in this country exceeds 200. The lake of Neufchâtel alone has furnished forty. Each village was composed on the average of about 300 huts.[1]

It is no easy task to decide the precise motive for the construction of these lake dwellings. It is scarcely likely, as some authors have maintained, that they were simply huts, used temporarily for fishing, or magazines for food and other stores, if we take into consideration the immense labour it must have cost to build them. Moreover, it is impossible by this hypothesis to account for the number and diversity of the objects found among the piles if we deny that these places were lake villages or cities, inhabited by a population already so dense that certain districts contained from twelve to fourteen hundred souls.

Again it has been said, but there are absolutely no grounds for the assertion, that these houses on piles were places of temporary meeting, and even temples consecrated to the worship of the waters.

Everything seems to show that the oldest lake dwellings of Switzerland do not go back beyond the neolithic age, and that they ceased to exist quite at the beginning of the iron age, that is, shortly after the Roman invasion. The huts of Moosseedorf, Wangen, Robenhausen, Meilen, Concise, Saint Aubain, &c., belong to the age of polished stone. None of the lake cities of the bronze age which have been hitherto discovered are situated in the east of Switzerland. To this age belong those of Geneva, Bienne, Sempach, Morat, Cortaillod, Auvernier, Neufchâtel. Those

[1] At Wangen, near Lucerne, and in the lakes of Zurich, of Pfeffikon, and of Constance, floors or platforms placed one above the other were remarked, bearing circular huts with a conical roof thatched with straw and bark. These platforms, though much damaged, still measured forty-two feet in length by fifty in width.

of Bienne and Neufchâtel witnessed the earliest days of the iron age and come very near to historic times. At la Tène a Roman coin bearing the effigy of Claudius was discovered, which would seem to prove that this settlement existed as late as the middle of the first century of our era. Moreover, a vase bearing a Latin inscription was discovered in the lake of Bourget, and some Roman swords at Bienne.

Some of these settlements contain remains belonging to two or three different ages. For instance the ages of stone and bronze are represented at Estavayer, and those of stone, bronze, and iron at Neufchâtel and Nidau.

In the east of Switzerland the lake cities disappear with the age of stone; in the west they last until the iron age. Some few even seem to have lasted to the beginnings of history, but to fix the precise date of their first appearance seems to be too bold an attempt. Certain authors, however, assign an age of 5,000, and even of 7,000 years to the oldest lake cities, whose construction would thus be anterior to that of Nineveh and Babylon. Troyon makes them date from 2,000 years before our era, that is, eight to ten centuries before the Trojan war, and M. Gervais himself adopts this calculation, which probably falls considerably short of the truth. Finally M. Rütimeyer believes that the lake cities form in Switzerland the earliest stage in the history of the human race, a conclusion which is inadmissible since the discovery at Verrier,[1] at the foot of Mont Salève, of human constructions of the reindeer age,[2] which M. Ed. Lartet, an authority on such questions,

[1] The hill of Verrier, at the foot of Mont Salève, near Geneva, was formed by a landslip of the almost vertical strata of this mountain after the glacial epoch. The cavities left between the great blocks of which it is formed afterwards served as shelter to man. But the presence of carved reindeer bones in this place, and especially those of Thayngen, and the total absence, or at least the extreme rarity of such remains in the lake cities, incontestably prove that the arrival of man in Switzerland is anterior to the lake dwellings.

[2] Reindeer bones, carved or otherwise, had, before these discoveries, already been observed in different parts of Switzerland, notably in the neighbourhood of Geneva, on the lake at Meilen, and at Windisch on the banks of the Reuss. All these bones were found in the alluvium of

believes, judging from the workmanship, to be contemporary with several settlements of Périgord of the so-called second epoch (reindeer age). The recent discovery of the cave of Thayngen, near Schaffhausen, confirms the theory of the learned palæontologist. The inhabitants of the lake dwellings were therefore preceded in Switzerland by the dwellers in the caves, who date from the archæolithic epoch, and perhaps even they are not the earliest representatives of the human race in that country.

It is generally admitted that the lake cities were more than once, by accident or design, destroyed by fire. The ruins found at the bottom of the lakes are a clear proof of this fact. A terrible conflagration seems to have marked the limit of each historical period.

The confused and vague ideas which are all that we hitherto possess, will not allow us to give a definite reply to the question as to who these strange people were that built and inhabited these lake cities. Here, as in many other cases, there is an immense field for conjecture, and adventurous minds may give the rein to their imagination. If we consult the archæologists of the north—M. Worsaë, for instance—they tell us that the first inhabitants of the lake cities were aborigines of the west and north of Europe, of Keltic origin. Their race endured as long as the lake dwellings, and perfected itself in arts and manufactures on the spot they inhabited. Keller, Dessor, and Virchow share this opinion. The almost complete identity of plan in the lake buildings of different epochs; the great resemblance of certain objects in common use, made of stone, bronze, iron, and clay; the similarity of the way in which fruits and other provisions of various kinds were preserved; all this seems to refute the opinion held by M. Troyon and others, that peoples of different races and degrees of civilisation successively invaded and occupied the lake dwellings, the conqueror imposing his customs, industry, and way of life upon the conquered.

the terraces which succeeded the glacial epoch, and at a height of considerably more than twenty-five or thirty yards above the actual level of the rivers and lakes of Switzerland.

From the fact that certain agricultural processes practised in Switzerland during the epoch of polished stone somewhat resembled those which the ancient Egyptians had adopted about fifty centuries before the Etruscan period, Carl Vogt concludes that the builders of the lake cities came from the banks of the Nile long before the first Aryan migrations, and before the use of metals was known in Egypt. Unfortunately the data upon which so original an opinion is based do not appear to us sufficient to place it beyond dispute.

II. IMPLEMENTS OF STONE AGE FOUND IN THE SWISS LAKES.

The objects found in the Swiss lakes, under the peat, and among the ruins of the lake dwellings of the stone age, are, as was to be expected, very similar to those found in the caves of the neolithic age. But a harvest richer in many respects is gathered from the lake dwellings, since, independently of the weapons and utensils of every kind in stone, bone, and clay, the remains of a fauna and flora almost completely similar to our modern fauna and flora have been discovered in them.

FIG. 32. AXE, WITH HORN SOCKET AND WOODEN HANDLE, FOUND AT ROBENHAUSEN. (After Lubbock.)

The stone axes, hammers, and chisels are always

highly polished, and usually fixed in a handle carved from the antler of a stag (fig. 32). Stones for polishing purposes, grindstones, stones for crushing corn, and stone hearths, are not rare in the lake cities. Paring knives, or polishers, of which some are a species of jade highly polished, are usually fixed in a stag's-horn handle. Lance and arrow heads and knives of flint are not uncommon, and, as usual, represent the types universally adopted. The same holds good of the weapons. The flint saw (fig. 33), usually only two or three inches long, is fixed in the groove of a wooden blade and is held firmly in its place by a dark-coloured cement of which the composition is unknown. Utensils and tools of bone and horn have also been found, such as knives, scissors, axes, hammers, arrows, harpoons, bodkins, fish-hooks, straight and curved needles, pierced by one or two holes, and sometimes even grooved to prevent the thread from interfering with the free play of the implement. Some needles are sharpened at both ends, and the eye is then in the middle. The bone hairpins present the closest resemblance to the metal ones of modern days. The innate taste for ornament shows itself in the rings and bracelets of bone or stone, in the necklace beads made of Baltic amber, of stags' antlers sawn into fragments more or less small, and even of nuts pierced through and through. Horn drinking cups of varied forms, and naturally of small size, have been found at Concise and Moosseedorf. One of these, hollowed from a stag's antler, was furnished with a wooden bottom attached by means of three pins, of which the holes are to be seen near the lower edge.

FIG. 33. FLINT SAW. (After Lubbock, 'Prehistoric Man.')

A quantity of fragments of rude pottery, like that of the caves of the neolithic age, sometimes blackened by plumbago, not thrown on the wheel, and but very slightly ornamented, have been taken from a number of these lake settlements (fig. 34). Some vases are intact, but rather small, with flat and rounded bottoms, while in the

succeeding age vases of a similar nature ended in a conical point and were supported on stands or rings of clay.

FIG. 34. FRAGMENT OF POTTERY FOUND IN THE LAKE OF ZURICH. (After Lubbock.)

Several of those found at Concise bear two lumps or knobs pierced with a hole to allow of their being suspended by a cord.

FIG. 35. PIECE OF WOVEN STUFF FOUND AT ROBENHAUSEN. (After Lubbock.)

The weaver's shuttle, the spindle, the weights destined to aid in the rotatory movement of the spinning wheel, the loom itself, with its spools for stretching the thread,

already existed. Cords made from the bark fibre of certain trees, thread made from flax (not hemp), woven and plaited stuffs, had been discovered at the bottom of the lakes of Constance and Pfeffikon, at Wangen and Robenhausen (fig. 35). Twigs of willow, interlaced with straw, were even found at Wangen, probably the remains of a basket even more ancient than that used by queen Aah-Hotep (see p. 33).

The preserving property of peat explains, in part at least, the preservation for such a length of time of all these tissues, as well as that of the half-carbonised cereals, seeds, and fruits, of which Heer discovered the existence in the lakes of Constance and Pfeffikon (see p. 120).

Lastly, in one of the oldest settlements of the lake of Bienne, that of Locras (age of polished stone), M. Grass discovered wooden bowls and platters, and even little birch-bark boxes, furnished with lids and made to open and shut at will by means of a string hinge. Objects made of stag's horn or bone are not uncommon at Locras. Several of great historic interest have been discovered in that place: among others a comb pierced with a hole by which it might be suspended, maces, or battle axes, which still retain a part of their handle, and a sort of wand of office. The bone objects include fish-hooks, daggers, and a sort of comb for carding flax, formed of three ribs split lengthways, pointed at one end, and joined together by fine string. Lastly, a flat rectangular piece of bone pierced with a hole at one end, was probably used for making nets. Few tissues occur at Locras; but, on the other hand, several balls of thread, string, and cord have been found there.

At Gerafin (lake of Bienne, stone age), a spoon was found made of yew wood beautifully wrought, and at Weyeregg, Austria (age of polished stone), a bone fork. The lake dwellings of the stone age have also furnished a great number of bones of animals, of which a list will be found on p. 119. There are no entire skeletons, and the bones are generally split lengthways, in order to extract the marrow, a very ancient and per-

sistent custom, since it dates from the earliest stone age, from the epoch even of the cave bear and mammoth, and it is still practised by the Lapps and other peoples of the Finn race who inhabit the north of Europe. To their praise be it spoken, no trace of cannibalism has been observed among the inhabitants of the Swiss lake dwellings.

Switzerland is not the only country in which lake cities occur. Italy, Austria, Hungary, Pomerania, France, and Savoy possess huts built on piles after the manner of those of Switzerland, but they are generally smaller, and nearly all belong to the age of polished stone. Occasionally, however, metal objects occur in them, probably of foreign origin, which were imbedded in the mud of the lake at a date subsequent to the construction of the huts. Paolo Lioy has described those of Lake Fimon (Italy), and he maintains that they belong to the reindeer age.[1] Those of Savoy are far less ancient, since some of them, that of Grésine for instance on the lake of Bourget, are, according to M. Rabut, not more than 3,000 years old. Those of Lake Paladru in Isère are yet more recent; for M. Chantry, who explored them with so much care, found in them a quantity of iron objects and even a Carlovingian coin. However, history makes no mention of this lake city. The local tradition that the ruins of an ancient city which had been destroyed by divine vengeance existed at the bottom of the lake, led to the discovery of the ruins of a lake village occupying in point of fact the spot indicated.

A recent author[2] has even asserted that Toulouse was once a lake city; but M. de Mortillet has refuted this opinion in a manner which appears to us conclusive. It is worthy of remark, however, that according to Strabo, Cicero, and Justinian, a sacred lake existed formerly in the neighbourhood of Toulouse where the neighbouring tribes offered gold and silver to their gods.

[1] See Paolo Lioy, *Le abitazioni lacustre della età della pietra nel Vicentino*. Vicenza, 1865.

[2] See *Revue archéologique du Midi de la France*, 1866-1867, pp. 170 and 196.

III. THE INHABITANTS OF THE LAKE DWELLINGS. THE SWISS EPOCH OF THE LAKE DWELLINGS. MANNERS AND CUSTOMS OF THEIR INHABITANTS.

At the epoch of the lake cities, immense forests, already peopled by our modern fauna, covered the slopes of the Swiss mountains, and descended sometimes to the very shores of the lakes. Here the urus, the aurochs, the red deer, the roebuck, the wild goat, the wild boar, the wolf, the fox, roamed at liberty. The otter disported himself in the clear waters the beaver constructed its dams, the brown bear crouched in his cave, while the *lämmer-geyer* (lamb-slayer vulture), watching his prey, hovered in the air. The dog, already the companion and help-mate of man, hunted with him the denizens of the forests whose flesh served as food for both of them. Besides the dog, the dwellers on the lake had brought under their sway the greater number of the animals which are now domesticated: the ox, the goat, the sheep, the pig, and perhaps even the horse—an immense step in advance, which even rendered agricultural labour possible. In effect they cultivated most of our cereals. The spoils of hunting, and of fishing with net and line, milk, and fruits of all kinds, also served for nourishment.

To judge from certain of their works of art and ornaments (coral necklaces, amber beads, jade, &c.), it would appear that they carried on a commerce by barter with the peoples of the Mediterranean, of the Baltic, of the Scilly Isles, perhaps even of the East. But these assertions are possibly rash, and are still the subject of serious doubts. They were clothed in skins, sewn or unsewn, and in hempen or linen stuffs skilfully woven. Woollen stuffs were unknown to them; at least no trace of them has hitherto been found. The arts of making baskets,[1] ropes, and lace, had already reached a comparatively advanced stage of development. Their pottery, not made upon the wheel, is not wanting in a certain elegance. But the arts of design were in an extremely backward

[1] Baskets closely resembling those taken from Egyptian tombs have been found in Switzerland.

condition, compared to their development in the reindeer age among the inhabitants of the caves of Périgord and Languedoc. Their architecture was of the simplest description; but their carpenters had invented ingenious methods of joining, mortising, dovetailing, &c., of remarkable size and solidity, which are in no respect inferior to several of those adopted in our own day. Finally, with the aid of fire and of flint tools, the lake dwellers of the age of stone constructed boats of astonishing size and solidity.

In our present social conditions it is difficult for us to understand the motives which led the early inhabitants of Switzerland to expend so much labour in constructing dwellings above the surface of the water. But if we consider that at that remote epoch Switzerland was almost covered by impenetrable virgin forests, inhabited by innumerable wild beasts, we shall understand these superhuman efforts to defend themselves from their attacks, and to avail themselves of the protection of water against the attacks of an enemy of superior strength. With regard to the moral life of the lake dwellers of Switzerland we are reduced as in so many other cases to mere conjecture. Those of the neolithic age probably worshipped nature, but they did not stain their religious rites by bloody sacrifices. It is said that the erratic blocks, scattered in such profusion in all mountainous districts where glaciers occur, served them for altars.[1]

Until quite lately it was not known where and in what manner the lake dwellers buried their dead, or even if they did so at all. A recent and quite unforeseen discovery has thrown light upon this doubtful question; I allude to the discovery made at Auvernier, not far from the shores of Lake Neufchâtel, of a burial cave containing at least a dozen corpses of every age and sex, which had been interred in stone coffins. This stone coffin, like those

[1] Some antiquaries consider that this use was made of, 1st, the *Court Stone*, still to be seen in the lake near Lausanne; 2nd, the *Nodding Stones*, situated near Geneva; and 3rd, the *Wedding Stone* (lake of Neufchâtel), where, a few years ago, betrothed couples still swore eternal love and fidelity to each other.

found in England, was barely six feet long by three and a half wide, and five deep. It was formed of great slabs of granite placed upright and covered by other stones, like the dolmens, with this difference, however, that the tombs of Auvernier were hollowed in the ground and enclosed by granite slabs. Moreover, on the southern side there was a sort of narrow passage, with no stone roof, communicating with the principal division or tomb. Another accessory chamber, constructed on the northern side, enclosed two skulls and a few bones. Although some bronze objects (evidently of more recent importation) were found in this new kind of dolmen, M. Desor attributes the tomb of Auvernier to the end of the neolithic age.

It therefore appears that the lake dwellers committed their dead to the earth and surrounded them with stone slabs in the form of a coffin, thus suggesting a comparison with the gigantic monuments which we shall describe under the name of dolmens. The objects interred with the dead, although few in number, also bear a close resemblance to those of the dolmens (serpentine axes perforated for suspension, teeth of bears and wild boars, and bone discs also pierced, &c.).

The anatomical characteristics of the lake dwellers of Switzerland are scarcely better known than their moral and religious ideas. However, M. His, upon insufficient data as we think, has undertaken to class them according to the form of the skull. He distinguishes four principal types:—

1. That of Sion, where the dolichocephalous[1] character is strongly marked.
2. That of Hohlberg } Both dolichocephalous.
3. That of Bel-Air }
4. That of Dissentis, the only brachycephalous type.

But we place little faith in these sharply defined racial characters.

[1] The dolichocephalous skulls (or long-heads) are those of which the form is comparatively long and narrow; the brachycephalous (or short-heads) are distinguished by their relatively greater transverse diameter, as compared to the longitudinal section; the mesocephalous (or mean-heads) hold the middle place between the two above-mentioned forms.

To judge from the bones, unfortunately few in number, found in the Swiss lakes, their inhabitants were of small size and possessed of no grace of limb. But we cannot decide with certainty the ethnic origin of these strange tribes, which is enveloped in obscurity, so that we can only wander with uncertain steps in the region of conjecture. Nevertheless, these unknown people, be they whom they may, have left to us beneath the clear waters of their lakes, records whose meaning is as clear as that of the pyramids, the statues, and the sphinx of Egypt. Modern science has already cleared up unexpectedly some points of the history of this people; but there is no written record of its origin or its end, and the bones which remain are too few in number to allow us to decide with certainty to what race it belonged.

FAUNA OF THE SWISS LAKE DWELLINGS. (After Rütimeyer.)

Ursus arctos	*Sus scrofa ferus*
Meles vulgaris	„ *palustris*
Mustela foina	„ *domesticus*
„ *martes*	*Equus caballus*
„ *putorius*	*Cervus alces*
„ *erminea*	„ *elaphus*
Lutra vulgaris	„ *capreolus*
Canis lupus	*Ovis aries*
„ *familiaris*	*Antilope rupicapra*
„ *vulpes*	*Bos primigenius*
Felis catus	„ *bison*
Erinaceus europæus	*Taurus primigenius*
Castor fiber	„ *brachyceros*
Sciurus europæus	„ *frontosus*
Mus sylvaticus	*Capra ibex*
Lepus timidus	„ *hircus*

To this list we must add about twenty birds and ten species of reptiles or of fish which are still extant. Out of the thirty-two species of mammalia mentioned above, six were domesticated, namely, the dog, the horse, the pig, the goat, the sheep, and the ox, of which last there were several varieties. The hare is extremely rare, and the mouse, the rat, the cat, the ass, and the fowl are entirely absent. It will be seen that this fauna also differs from the present fauna of Switzerland by the possession of the

urus, of the *aurochs* or European bison, the elk, the stag, and the wild boar.

IV. THE FLORA OF THE SWISS LAKE DWELLINGS.

Like the fauna of the same epoch, this flora offers the closest analogy with that of our day. However, a plant then very common in Switzerland (*Trapa natans*) seems to have completely disappeared, though Lubbock affirms that it is still occasionally to be met with. Some few have only changed their altitude; such are the *Pinus mughon* and the *Nuphar pumilum*, or dwarf water lily. For the rest, this flora, in its two principal elements, the plain and the mountain, has its root in the lignites of Dürnten and Utznach, where larches, pines, and maples of similar species to the modern ones occur.

We subjoin a list drawn up by Professor Heer, and borrowed from the work 'Habitations Lacustres,' of M. Troyon, of the seeds and fruits of the stone age found in the Swiss lakes.

I. CEREALS.

Wheat	*Triticum vulgare*, Will.	Robenhausen.	Wangen[1]
German wheat	„ *diococcum*, Schw.		„
„ „	„ *monococcum*, L.		„
Six-ranked Barley	*Hordeum hexastichon*, L.	„	„
Double-ranked Barley	„ *distichum*, L.		„

II. FRUITS.

Appletree (two varieties, wild and cultivated)	*Pyrus malus*, L.	Robenhausen.	Wangen
Pear tree	*Pyrus communis*, L.	„	„
Cherry tree	*Prunus avium*, L.	„	
Plum tree	„ *insitiicia*, L.	„	

III. TEXTILE PLANTS.

Flax	*Linum usitatissimum*, L.	Robenhausen.	Wangen

[1] At Wangen several bushels of wheat were found heaped up in one place. This was evidently the provision of some family or tribe. The preservation of seeds, fruits, and even bread, found at Robenhausen and Wangen, is a most unexpected phenomenon, but it can be explained by the more or less complete carbonisation which they have undergone, and by the preserving virtue of the peat in which they are found. What are the antiquities of Herculaneum and Pompeii compared to those of Wangen and Robenhausen?

IV. Edible Wild Fruits.

Hazel nut[1]	*Corylus avellana*, L.	Robenhausen	
Beech nut	*Fagus sylvatica*, L.	„	
Blackberry	*Rubus idæus*, L.	„	Wangen
Raspberry	„ *fructicosus*, L.	„	
Strawberry	*Fragaria visca*, L.	„	
Sloe	*Prunus spinosa*, L.	„	

V. Other Seeds and Fruits which may have been used for Food.

Bird cherry	*Prunus padus*, L.	Robenhausen	Wangen
Water chestnut	*Trapa natans*, L.	„	
Yew	*Taxus baccata*, L.	„	
Common Cornel (Dog-wood)	*Cornus sanguinea*, L.	„	
Water lily	*Nymphæa alba*, L.	„	
Yellow water lily	*Nuphar luteum*, L.	„	
Dwarf water lily	*Nuphar pumilum*, L.	„	
Lake scirpus	*Scirpus lacustris*, L.	„	
Scotch fir	*Pinus sylvestris*, L.	„	
Marsh fir	*Pinus uliginosa*, L.	„	

We must add to this list the *Sambucus nigra* or common elder, of which the fruit is edible, and is used to make a preserve; the *Triticum turgidum* (Egyptian wheat), *Triticum spelta*, *Secale cereale*, *Avena sativa*, *Panicum miliaceum*, *Setaria italica*, *Silene cretica*, *Faba vulgaris*, *Pisum sativum*, *Ervum lens*, *Linum angustifolium*. Hemp appears to have been unknown to the lake dwellers of Switzerland.

V. ANCIENT AND MODERN CONSTRUCTIONS SIMILAR TO THE LAKE DWELLINGS.

All the authors who have studied the huts built on piles have mentioned those of Lake Prasias, in Thrace, as presenting a remarkable analogy with the lake cities of Switzerland. Professor Virchow of Berlin, one of the last to treat of them, gives from Herodotus (fifth century before Christ) the following description of the aquatic dwellings of the ancient Pæonians:—

'The people of the Pæonians dwelt in Thrace. Several of these tribes had settled on dry land. But one of them inhabited a city built on piles, in the middle of the lake

[1] Some of these have a hole bored through them, as if they had been used for necklace-beads or children's toys.

of Prasias, whose only communication with the shore was a narrow bridge. The town, of which the piles had been set up in the first instance by the common labour of the citizens, continually increased in size; for each citizen who took a wife was bound to bring three posts from the neighbouring forest of Orbelos, and to fix them in the lake; the number of wives was not limited. On these piles a common flooring of beams was placed, and each man built thereon his hut, communicating with the water by a trapdoor. They fastened the little children by a cord that they might not fall into the water. Horses and cattle were fed upon fish, which were so abundant in the lake that it was only necessary to open the trapdoor and let down a net, which was soon filled.'

Hippocrates, in his treatise on Air, Water, and Places, tells us that the people settled on the banks of the Phasis (the river rendered famous by the Golden Fleece and the Expedition of the Argonauts) built houses of wood and reeds on piles in the middle of the marshes; their health, he adds, is much impaired by this way of life.

Even to this day, and in the same place, the inhabitants build their dwellings as in the time of Hippocrates. Virchow further informs us, on the authority of the traveller Maurice Wagner, 'that the town of Redout-Kaleh, on the Chopi, is composed of two long rows of wooden huts. These huts, which are hardly larger and more spacious than the booths at Frankfort fair, rest on piles raised a foot above the marshy soil. The same is true of Novo-Tscherkask, the capital of the Cossacks of the Don.' (Virchow, 'Revue des cours scientifiques,' 1866, vol. iv. p. 10.)

In modern times we know of a number of places where habitations are constructed more or less resembling the lake cities of ancient Helvetia. Without speaking of the Papuans of New Guinea, who at the present day build their houses precisely after the fashion of the Pæonians, the persistence of this same mode of construction among the inhabitants of the banks of the Phasis, and even among the Cossacks of the Don, is worthy of remark. Very

similar habitations occur also in various parts of Oceania, in Borneo, in the Islands of Ceram and Mindanao, &c. Dumont d'Urville saw at Tondano, in the Island of Celebes, a town now almost entirely destroyed, private dwellings supported on piles artistically carved, and representing men and animals. He tells us that Tondano is a compound word, signifying *man of the water*, and that the houses of

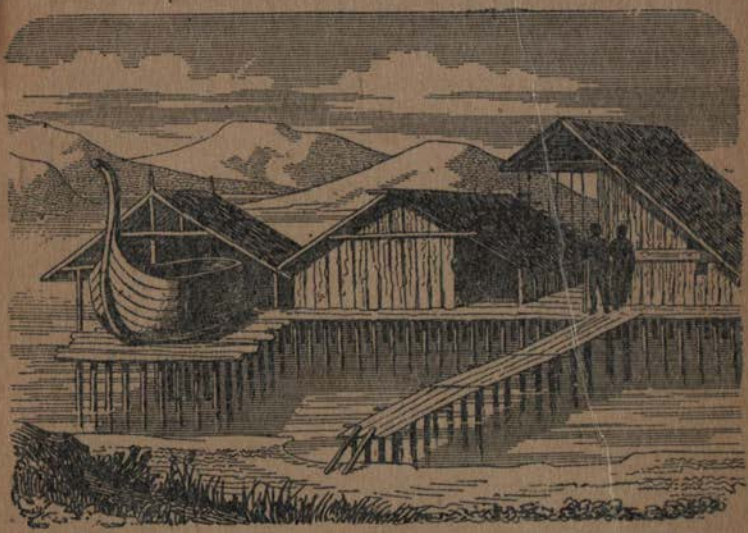

FIG. 36. MODERN LAKE DWELLINGS OF THE INHABITANTS OF NEW GUINEA. (After Dumont d'Urville.)

this town bore a striking resemblance to the reed huts and marsh dwellings of la Vendée, his native country.

In the port of Doreï in New Guinea certain houses, or sanctuaries consecrated to the gods, are raised on piles representing naked human figures. In many tribes the ordinary houses are also built in like manner (fig. 36).

The interior of Africa is still too little known to enable us to mention many lake dwellings in that country. The practice of building above the surface of the water seems however to have taken root there, at least along the banks of the Niger, the Zambesi, and the Tsadda.

In Cochin China, the present inhabitants of Camboja (placed under the protectorate of France in 1864), 'live,' Dr. Noulet tells us, 'in bamboo huts supported on piles, not only along the banks of the rivers, but also on land, and even in the vast forests which cover the interior of the country, and in places where there can be no risk of floods.'[1]

With regard to America, we know that in order more surely to avoid hostile attacks, the Aztecs raised their houses of cane and reed on piles, planted among a group of low and marshy islands, which they afterwards connected by dikes protected by palisades. Such was the origin of Mexico, which resembles at once, as we see, the

FIG. 37. TRANSVERSE SECTION OF AN IRISH CRANNOGE. (After Lubbock.)

crannoges of Ireland (fig. 37) and the lake dwellings of Switzerland.

Lastly, on their arrival in the New World, the Spaniards saw on the lagoon of Maracaïbo a kind of village entirely built on piles, 'a little wooden Venice,' says Elisée Réclus, to which one of the republics of Columbia owes at the present day its name Venezuela. In the same way the floating islands[2] of the ancient Assyrians and Chinese had, or have still, their parallels in Mexico, in those floating gardens which the first historians of the conquest describe with enthusiasm, and which were a species of raft covered

[1] Dr. Noulet, *L'âge de la pierre polie et du bronze au Cambodge, d'après les découvertes de M. J. Moura, lieutenant de vaisseau, représentant du protectorat français au Cambodge*, in the archives of the Natural History Museum of Toulouse, 1879, p. 6, first report.

[2] On the Assyrian bas-reliefs are to be seen artificial islands formed of great reeds, interlaced with one another, and which served as dwellings to the wealthy men of the time of Nineveh and Babylon.

with soil, bearing houses surrounded by the fairest flowers and the richest vegetation.

According to M. Desor, the *Isle of Roses*, in the lake of Starnberg in Bavaria, is only an artificial island dating from the stone age, and inhabited from that time down to our own day. At this very day a castle rises in the midst of its cool shade.[1]

VI. THE NURAGHI OF SARDINIA.

The Nuraghi are perhaps the most curious monuments of the stone age. Those cyclopean constructions, which have withstood the wear of centuries, and which, scattered almost in profusion throughout Sardinia (the Abbate Spano has counted more than 40,000 of them), still rear their imposing mass before the wondering eyes of the traveller and of the archæologist. There is no doubt that they were the cradle and home of the primitive races who settled in the island in the remote past. The labours of the learned Abbate Giovanni Spano[2] have proved beyond dispute that we have here one of the earliest examples of the natural formation of a society by men after they have abandoned the nomadic life of hunters. Here, as Mantegazza has happily expressed it, 'We may read a page of history written by an ancient people over the whole face of Sardinia.'

What this people was, we do not know. Spano supposes them to have come from the plains of Shinar at the time of the great emigration which dispersed the tribes of Chaldea through Persia, Palestine, Greece, Italy, and Northern Europe. The first comers grouped their dwellings in the most favourable sites for combined resistance in case of a hostile invasion. By degrees, as the chiefs of the tribes grew more powerful, as the family increased, the dwellings became more numerous. New comers built others; and here we find the explanation of the fact that all the Nuraghi are not equally well built,

[1] E. Desor, *Les Palafittes ou constructions lacustres du lac de Neufchâtel*, p. 11. Paris, 1865.

[2] See Giovanni Spano, *Paleontologia sarda, ossia l'età prehistorica segnata nei monumenti che si trovano in Sardegna*. Cagliari, 1871.

the earliest being constructed simply of natural masses, which had been detached from the neighbouring rocks and lay scattered upon the ground, while those of a later date are built of hewn stone, although the masonry still remains rude. The former belong to the stone age, the latter to that of bronze.

FIG. 38. A SARDINIAN NURAGHI OF THE EARLIEST EPOCH.

They are all in the form of a truncated cone. Some have only one room; others two, and sometimes even three, one above the other. In the interior of these there is a winding stair made of enormous blocks placed at an acute angle in the thickness of the wall, leading to the upper chamber. Others again have an outer wall enclosing a triangular or polygonal space, with an apartment of the same form as the Nuraghi at each angle. These rooms communicate with each other by vaulted passages of which the roof is almost always pointed. Each layer of stone is laid without mortar (figs. 38 and 39). The interior consists sometimes of a great room with a conical roof, and capable of containing forty or fifty people.[1] The vaulted roof is built of uniform

FIG. 39. VERTICAL SECTION OF THE SAME, SHOWING THE NICHES AND THE WINDING STAIR.

[1] The Nuraghi tetirola of the land of Botolana serves as a shelter in

stones, disposed like those of our modern buildings, presenting, that is to say, their larger end to the outer, and their smaller to the inner surface of the wall.

The most ancient Nuraghi have but one room, without niches or hiding-places constructed in the thickness of the wall, and terminated in a pointed arch. Three such niches usually occur in the dwellings of a later age, one opposite the door, and one on either side. Another niche to the right of the door was intended as a lurking-place for the defender of the entrance in case of attack.

The soil which has been formed round the earliest Nuraghi since their construction is no less than two or three yards in thickness. In the lowest layer we find remains of rude hand-made pottery, coal and bones crumbled to dust, but never bones of species extinct in the island, except stag's antlers and boar's tusks, intermixed with accumulations of the remains of birds. Pieces of flint and of obsidian occur also, axes of black basalt and porphyry of the archæolithic type, fragments of pottery, &c., some of which appear to belong to the earliest stone age.[1]

In the succeeding layers, we come to polished axes, arrow heads, knives, stones for slinging, fossilised teeth of the dogfish, pottery which has been partially baked by

winter to about 500 pigs, driven down from the mountains by the swineherds.

[1] Many French archæologists maintain that pottery dates only from the age of polished stone. We know, however, that M. de Serres found at Bize in Aude, and M. de Christol at Souvignargues in Garde, fragments of pottery which it is scarcely possible not to consider contemporary with the reindeer, perhaps even with the bear, in company with whose remains they were found. I myself extracted some from a bear cave at Nabrigas (Lozère), M. Ferry at Vergisson, near Mâcon, and M. Dupont in several bone caves of Belgium has observed specimens of still earlier date. Lastly, the Abbate Giovanni Spano assures us that he found in the different layers of soil which surround the Nuraghi of Sardinia, earthen vases (entire or in pieces) belonging to all the ages, '*stoviglie che in se portano il carattere di un' età la più rimota*,' says the learned abbate. He calls attention also to the fact that the rudest specimens occur in the lowest layer. Those which are found in the second or middle layer are less rude, and so on until we arrive at the uppermost strata, where they are smooth and polished. Some few even appear to belong to the Roman epoch. On the other hand, in the giant tombs in the neighbourhood of the Nuraghi, we only find ill-formed pottery of the rudest description.

fire, with teeth of the wild boar and other animals, and shells of several species of molluscs, which appear to be the kitchen refuse of these primitive tribes. Lastly, smooth black fragments of pottery have been extracted from the upper layers, as well as pieces of bronze, which indicate the age of transition between stone and this metal. The Abbate Spano has not been able to find any iron objects: he accounts for the absence of iron by the destructive effect of damp ground and the influence of the atmosphere upon this metal.

The same savant attributes the construction of the

FIG. 40. BURGH OF MOUSSA, SHETLAND ISLES. (After Lubbock.)

Nuraghi to the first immigrants who came from the East into Europe. Orientals or aborigines, archæolithic or neolithic, these peoples have in any case left us monuments of real and great value to the history of humanity, and although we do not adopt all the Abbate's theories without reserve, we recognise with gratitude the zeal which their discoverer has displayed in dispelling, to some extent, the obscurity which still envelopes them.

Similar monuments have been found in the Balearic isles, where they are known by the name of *Talayoti*; in the Island of Pantelleria, where they are called *Sesi*;

and even in France, in the department of Hérault, according to M. Cazalis of Fondouce.

But they are especially numerous in Scotland and the neighbouring islands. They are there known as *burghs* or *brochs*, and we give an illustration of one of the most celebrated, the burgh of Moussa, one of the Shetland Isles (fig. 40). It will be seen that these monuments resemble in every respect the Nuraghi of Sardinia, and the existence of an identical type in so distant a country renders the truth of the hypothesis of the Abbate Spano with regard

Fig. 41. Fort of Staigue (Kerry.)

to the origin of the builders of the Nuraghi extremely doubtful.

In the British Isles, moreover, the construction of similar buildings of uncemented stones continued until very late, and some of them, like Fort Staigue, for instance (fig. 41), are certainly subsequent not only to the age of stone, but even to that of bronze.

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CHAPTER VI.

BURIAL PLACES.

I. VARIOUS MODES OF SEPULTURE.

As the anatomist demands from death the secrets of life, so the archæologist seeks in the tombs a revelation of the secrets of the past. If many tombs are forgotten or silent, others are faithful narrators of the history of bygone times, and, as it were, bring again to life those whose bones they contain, and make us acquainted with the customs and the ideas of the tribes or the nations to which they belonged. Moreover, all ruins appeal to the imagination; and what ruins can be more eloquent or more suggestive than a skull or any other human remains?

Some ideas and certain feelings appeal to the sympathies of all humanity, and this is especially the case with those respecting the worship of, and respect for, the dead. But the manifestation of these feelings, and the thoughts which result from them, vary considerably according to time and place. Thus the modern Hindus commit to the waters of the Ganges the bodies of their aged parents, whom they have purposely allowed to die of starvation on the banks of the sacred river. The inhabitants of the Viti Islands, and the Esquimaux, bury their nearest relations alive when they have attained a certain age, in order to spare them the inconveniences and sufferings of old age. According to Dumont d'Urville, the natives of New South Wales burn the bodies of those who die young and bury those of the old. Sir Massinger Bradley tells us that certain tribes of South Australia do not bury their dead, but light a great fire in the hut, and suspend the corpse above the hearth: when it is dried they wrap

it in a coarse cloth and lay it in a tree in the midst of the leaves. A yet stranger custom is that which the traveller Macdonald says that he observed among the natives of the Upper Mary River, in Queensland. They flay the dead, feed upon the flesh, and distribute the bones among the various members of the family. They prepare the skin with care, and bear it about with them as a precious relic ('Revue scientifique,' November, 1873, p. 476).

The cèremonies practised by the Egyptians in the embalming of bodies are well known, as well as the processes employed by the Peruvians of the time of the Incas in order to preserve the bodies of their deceased relations.

Burial places belonging to the archæolithic age are comparatively rare;[1] and many which were first believed to belong to the earlier epoch have proved, upon a nearer examination, to date only from the age of polished stone. Very little is known of the funereal rites practised in the early part of the quaternary epoch; but in the reindeer age (*Solutré; cave of Duruthy, &c.*) the bodies were stretched horizontally upon the hearths, surrounded with ashes and embers; sometimes the bones are more or less carbonised.

We are far better informed as to the treatment of the dead in the subsequent ages. Thus, in the neolithic epoch interment was the most widely diffused custom, but cremation was already practised towards the end of the epoch of the dolmens. This custom prevailed, but not universally, during the age of bronze. The last asylum which the tribes of the age of polished stone reserved for the dead was sometimes the natural or artificial caves which often had served them as dwelling-places; sometimes monuments of huge stones of various construction, but usually formed of slabs of unhewn stone and of colossal size (*uncovered dolmens, dolmens covered by a tumulus,*

[1] Gaetano Chierici asserts, however, that he discovered in Italy (a San Polo) some tombs which date in his opinion from the first stone age: he considers this burial ground to be hitherto unique in that country

cromlechs, covered alleys, giants' tombs, American chulpas). M. Broca was therefore in error when he laid it down as a principle that at the epoch of splintered stone men buried their dead in caves, and that in the polished stone age the dead were interred in dolmens; since in Aveyron, for instance, we find, at a short distance apart, monuments of huge stones and burial caves in which the objects buried with the dead are precisely the same (*e.g.*, the cave of Saint-Jean d'Alcas and the dolmen of Pilaude).

Cremation continued until the age of iron, when interment was once more practised. Such appears to have been the almost universal rule; but this rule was subject to numerous variations, according to the religious ideas of the different peoples and their reciprocal relations and alliances.[1] I desire no further proof of this than the ashes and calcined human bones discovered by the Earl of Antrim in certain neolithic tombs of Great Britain. A still more conclusive proof is that furnished by certain dolmens of Aveyron (those of la Marconnière), where M. Prunières found at the same time bones which had never been exposed to the action of fire, and others burnt black and shining like jet. Some fine lance heads of polished flint lay over these bones, but there was no trace of metal.[2]

During the iron age the two rites (interment and cremation) were sometimes practised simultaneously. In the case of the cremation of bodies the ashes and the bones which are not entirely consumed are placed in funereal urns, which form part of the furniture of the tomb.

The position in which the dead are placed varies with the mode of burial. Usually, in the age of polished stone the body is placed in a horizontal position on the ground or on the hearth, sometimes covered by a thick layer of ashes. It is very rarely enclosed in a coffin of un-

[1] At an epoch nearer to our own time the Romans burnt the bodies of their dead, the Etruscans buried theirs. The Gauls of the time of Cæsar committed the corpses to the funeral pile, but several districts of Gaul had remained faithful to the ancient practice of interment.

[2] Dr. Punières, *Fouilles des dolmens de la Marconnière, Matériaux*, 1877, p. 523. M. Waldemar Schmidt was mistaken in saying that dead bodies were never burnt in France at the epoch of polished stone.

hewn stones; this sort of chest or coffin is, on the other hand, extremely common during the age of bronze, and especially during that of iron. In the dolmens the body is generally in a sitting or crouching posture, the knees drawn up under the chin and the arms crossed on the breast. At least this is the attitude which seems to be indicated by the position of the bones, arranged in a circle round the skull, which usually occupies the centre of the heap formed by the whole.[1] This was also the position in which the ancient Peruvians and the Guanches of the Canary Isles placed their mummies, so that the corpse when returned to the earth, our common mother, might take the posture natural to the child in its mother's womb. The Assyrians, and the troglodytes of Ethiopia, also placed their dead in this attitude, as do also some modern tribes, the Baskirs, for example. Finally, as if primitive man had a faint presentiment of a future life, he placed beside the dead man his arms, tools, and ornaments—all the objects which he had valued during his life. They even left near him a supply of food destined to meet his wants in his new abode. The fire, of which the traces may be observed in certain sepulchres, was probably kindled to expel foul air, or with a view to some mystical purification. It may sometimes perhaps indicate a cannibal feast, as at Chauvaux, for instance.

We must not close this chapter without calling attention to the fact that among all peoples and in all epochs, the monuments destined to be the abode of the dead offer a close resemblance to the dwellings of the living, a resemblance which arises from the instinct of imitation, from the natural inclination of man towards symbolism, and from the widely spread belief that death is but a continuation of the same kind of life in another world:

Mors janua vitæ.

[1] Wilson mentions some British tombs of the stone age in which two crouching skeletons were found, together with necklaces of *Nerita littoralis*, with traces of other bones. This author thinks that these skeletons belonged to two tribal chiefs whose widows and servants had been sacrificed on their tombs. (Wilson, *Prehistoric Man*, p. 129, 1865.)

II. BURIAL IN CAVES.

After having served as a home for the living, the caves of the stone age often served as an asylum for the dead. Among the most famous we may cite those of Aurignac and Herm (Haute Garonne), of Cro-Magnon (Dordogne), of Duruthy (Basses Pyrénées), of Solutré (Saône-et-Loire), and among the caves of a more recent epoch, those of Saint-Jean d'Alcas (Aveyron), of Durfort (Gard), of l'Homme Mort (Lozère), and lastly the artificial caves hollowed out of the chalk on the banks of the Marne. We will examine a few of these burial caves, beginning with that of Aurignac.

Aurignac.—The discovery of the burial place of Aurignac, rendered famous by the remarkable treatise on the subject by M. Ed. Lartet, is due to a labourer named Bonnemaison, who, on introducing his arm into a rabbit-hole on the slope of the mountain of Fajoles, near Saint-Gaudens, withdrew a human bone of large size. Suspecting the existence of a burial ground on that spot, he began to clear the surrounding soil, and in a few hours perceived a large slab of sandstone, placed vertically against an arched opening which gave access to a spacious cavity. There lay a certain number of human skulls and skeletons, partly covered by loose soil, which was probably introduced into this sepulchral cave at the time of the interment of the bodies whose remains it contained.

The discovery of Bonnemaison attracted notice, and caused the old inhabitants of the country to recount tales about a gang of coiners of false money, who, they said, had formerly committed a number of murders and carried the bodies of their victims into the cave of Aurignac.

The truth really is that this cavity contained about seventeen human skeletons, which M. Amiel, mayor of the place, unfortunately caused to be re-buried in the cemetery of the commune before a strict and scientific examination made it possible to determine the precise date of the original interment.

Some time afterwards M. Ed. Lartet visited the cave, and found a few human bones still imbedded in the loam in which the others had been discovered. Beside them lay carved reindeer bones, bones of extinct species of mammalia, and splintered flints.

'The age of this burial ground,' observed M. Lartet, 'cannot be determined either by tradition, or by history, or by numismatic dates, since no such records have been found which can be used for this purpose. The absence of any kind of metal, the habitual use of tools and weapons of flint and bone, are sufficient indications to enable us to attribute this settlement of Aurignac to the prehistoric period known to modern antiquaries as the age of stone. Palæontology assigns the human race of Aurignac to the most remote period of antiquity in which we have hitherto discovered proofs of the existence of man or remains of his industry. For this race was not only contemporary with the aurochs, the reindeer, the great stag, the rhinoceros, the hyena, &c., but also with the cave bear, which seems, as we shall presently see, to have been the last to disappear of all that group of great mammalia always cited as characteristic of the latest geological period.'[1]

The intentionally broken bones of the reindeer, and of most of the extinct mammalia, show that man had long dwelt in this cave, had eaten his meals, and had perhaps celebrated funeral feasts therein.

L'Herm.—In 1862 MM. Rames, Garrigou, and Filhol explored the cave of l'Herm, and found in it a quantity of bones of *Ursus spelæus*, in company with rarer remains of *hyæna* and *Felis spelæa*. They also found some human bones, and did not hesitate to pronounce them contemporary with the extinct species. Our learned colleague Dr. Noulet, who visited the same cave at a later period of the same year, found in the vestibule, which had not been examined by the three naturalists whom we have just mentioned, the remains of about thirty human

[1] Ed. Lartet, *Sur la coexistence de l'homme et des grands mammifères fossiles. Ann. Sciences Nat.* vol. xv. 4th series, p. 381.

skeletons of all ages, fragments of pottery, bones carved by human hands, and lastly, polished axes of jade in a state of excellent preservation, a few necklace beads, and a ring of bronze. But the conclusions of the learned doctor were very different from those which his predecessors had formulated. One of them is thus expressed: 'The vestibule of the cave of l'Herm was the asylum of the dead.' This cave was, then, used as a burying place; at what epoch we shall shortly see.

Solutré.—Bruniquel, Laugerie Basse, la Madelaine, &c., were simply sheltered stations, that is, masses of rock overhanging more or less spacious retreats in which man might take refuge or even dwell. MM. de Ferry and Arcelin first, and afterwards M. Lartet and l'Abbé Ducrost, discovered at Solutré, near Mâconnais, a station in the open air which has at the same time been used as a burial ground, and which is therefore doubly interesting to archæologists.

At the foot of a picturesque hill which overlooks the village is a hillock formed of earth and loose stones, and containing a number of carved flints, heaps of kitchen refuse, works of art (carved reindeer horn and stone), human graves belonging to at least two epochs, bones of the reindeer, mammoth, *Arctomys primigenius*, &c., and especially a great quantity of bones of the horse. It was on this hillock that the tribe had settled, whose history, still obscure on many points, has been undertaken by MM. Ferry and Arcelin.

Solutré is remarkable for the enormous heaps of bones of the horse, more or less calcined, which form quite a wall of 130 feet long by 10 feet high round the principal enclosure and close to the hearths. It is calculated that the bones of more than ten thousand[1] individuals were employed in the construction of this wall. This remarkable accumulation was produced, in the opinion of

[1] According to yet more recent calculations, the number of horses at Solutré has been reckoned at 40,000, and the wall entirely formed of their remains is five feet in height by eleven to fourteen yards long, and four and a half feet wide.

MM. Ferry and Arcelin, by funereal rites and bloody hecatombs.

But we are inclined to doubt this theory, and rather consider these remains of horses as mere refuse heaps, true kitchen middens, similar to those of Denmark, of the Lapps, and of the Esquimaux. The wall of enclosure which we mentioned above probably enclosed a group of huts, of which the hearths are still to be found. These elliptical hearths were surrounded by a ring of unhewn stones, laid flat, and incomplete only towards the setting sun. The body of the dead was laid there, the head turned towards the west, and his weapons[1] and the objects which he had most valued while in life were placed beside him. The body was placed on ashes, burnt or broken bones, pieces of flint, or tools of different kinds. Human skeletons bearing evident traces of the action of fire are not uncommonly found, showing that the corpse was often laid upon the hearth while it was still warm, and the fire not quite extinguished. A certain number of graves have been found underneath the hearths themselves. Hence MM. Ferry and Arcelin are led to infer, and we hold the same opinion, that it was customary at Solutré to bury the dead in the hut where he had passed his life. The walls were then thrown down over the corpse, and another hut was often built upon the same spot, as the accumulation of kitchen refuse and of successive hearths above the human corpses seem to prove. The hearths of which we are speaking, situated at a considerable depth (averaging five feet and sometimes more), have to all appearance never been disturbed. The human bones which they contained are therefore contemporary with the bones of the reindeer and mammoth found with them.

Besides the graves of which we have just spoken, there are others, usually considered as belonging to the same

[1] Arrows are especially numerous at Solutré; and M. Ferry says they display an unequalled finish of workmanship. The bow appears to have been here in common use, and to judge from the form, the weight, and the finish given to these arrows, the hunters who dwelt there seem to have been skilled in archery.

epoch, which, instead of lying on the hearth exposed to the air, are placed upon heaps of horse bones; or they occupy the sub-soil, situated at a depth of two or three yards below the surface. In this case carved flints, reindeer bones and antlers, bones of the horse, and human remains are found scattered pellmell around them.

Lastly, other graves, disposed without any order, are formed of slabs of unhewn stone placed upright, which form together a sort of parallelogram destined to receive the body: a separate slab protected the head. This kind of grave, much more recent than the two first, does not appear to be of an earlier date than the age of polished stone; it is even possible that they belong to the Gallo-Roman epoch, and do not in that case come within the scope of this work.

The works of art and of industry found at Solutré, although very similar to those of Languedoc and Périgord, belong nevertheless to a different type, intermediate between that of Moustier and la Madelaine, and distinguished, as we have said, by the arrow and lance heads in the form of a laurel leaf, carved on both sides (fig. 18).

From the preceding facts we gather that Solutré was formerly inhabited, or at least frequently visited, by hunters of reindeer and horses. To judge from the human bones which are found there, the race who encamped in this place was below the middle stature, dolichocephalous, with high cheekbones, low retreating forehead, prognathous jaws, while their civilisation and the condition of their industry were about on a par with those of the troglodytes of Périgord.[1]

Burial Cave of Duruthy (Basses-Pyrénées).—We are indebted to MM. Louis Lartet and Chapelain-Duparc for the important discovery, made in 1874, and for the full

[1] M. Broca maintains, on the other hand, that the race of Solutré was not prognathous, that the tibias were not platycnemic, and that the perforation of the humerus was extremely rare. It is difficult to decide which of these contradictory assertions is correct. Unfortunately, ethnologists are far from being in perfect agreement with regard to prehistoric races, and even with regard to those now in existence.

description of a covered burial place, hollowed in the side of a sort of nummulitic promontory, which overhangs the valleys of the Gave de Pau and of the Gave d'Oloron. This cave, formerly much deeper than it is at the present day, bears on its walls traces of prolonged calcination, the natural effect of the fires lighted at intervals by the troglodytes who inhabited it.

There are bones of the reindeer, the aurochs, and the horse, teeth of the lion and the bear revealing designs cut with a flint knife, barbed arrow heads, bone fish-hooks similar to those of Périgord, and carved flints, some of which are very carefully wrought; and together with these a quantity of human bones were found, whose ethnical character is, according to MM. Quatrefages and Hamy, almost identical with that of the oldest Cro-Magnon race, from which that of Duruthy appears to be descended. The distinguishing feature of this burial cave is that the race of which we are speaking, found in the first instance at the base of the hearths underlying the burial ground,[1] in company with the bones of the bear, the lion, and the reindeer, recurs in a grave placed above the hearths of the age of the bear, along with weapons which seem to inaugurate the age of polished stone, at which epoch these animals no longer existed in France.[2]

Saint-Jean-d'Alcas and Baume-des-Morts. — The grotto of Saint-Jean-d'Alcas (Aveyron), and that of Durfort or Baume-des-Morts (Gard), both very small, and both containing almost the same funeral paraphernalia, are among the burial caves belonging to the latter part of the age of polished stone which has been the most thoroughly investigated. M. Cazalis de Fondouce found in the first human bones and skulls of every age and of both sexes; the second proved equally rich in human remains. These bones show no trace of calcination or of cannibalism. The author of the work on this subject attributes them, some-

[1] This race was represented by a single individual, whose crushed skull seems to show that he was killed by one of the landslips which occurred repeatedly in the chalk overhanging the burial cave.

[2] L. Lartet and Chatelain-Duparc. *Une sépulture des anciens troglodytes des Pyrénées*, Paris, 1874, p. 66.

what rashly as I think, to one of those races formerly so much talked of, and which he calls Celto-Ligurian, because he considers them as a mixed race descended from the Ligurians, the earliest inhabitants of the district of Larzac, and from the Celtic invaders; whereas the troglodytes of the Pyrenees of Ariége of the age of polished stone belong, according to him and to M. Garrigou, to the Celto-Iberian race.

Whatever we may think of these opinions, insufficiently proved even in the eyes of their supporters, it is at any rate a well-established fact, that towards the end of the neolithic age the inhabitants of the Pyrenees and of Gard buried their dead in caves and buried along with them a curious funereal paraphernalia of which the following is a list. Axes of polished serpentine, one in green jade, similar to those of the savages of New Caledonia; flint lance and arrow heads, skilfully wrought; stones for slinging; sections of belemnites and discs pierced for necklaces, similar to those which are sometimes found in considerable numbers in the caves of the age of the reindeer and bear;[1] long beads of stone or of jet in various shapes; ear-rings of similar materials, or of living or fossil shells, or even of the perforated teeth of certain mammalia (wolf, fox, wild boar, &c.). We may also mention a few ornaments carved in bone, such as pendants, possibly amulets; a little spindle made of buck-horn pointed at both ends, which was probably used as an arrow head; pieces of blackish pottery, not fire-baked or made on the wheel. All these articles are intermixed with the bones of animals of still extant species (dog, fox, badger, common stag, &c.).

Lastly, it is worthy of remark that at Durfort the human bones are for the most part buried at a considerable depth (twelve or thirteen feet) in the sediment of the cave; these are more scattered and less well preserved than those of the upper layers. The latter have besides retained to a certain extent their natural positions one to another; it seems likely that they were laid there while still clothed in flesh, and that the last comers took

[1] These perforated discs were made from fragments of the shell of the *Cardium*.

the place of the earlier corpses, of which the bones were then scattered loosely in the underlying soil.

Besides the furniture of the tombs, similar in nearly all points to that of Saint-Jean-d'Alcas, twenty-five to thirty beads and a fish-hook of red copper were found at Baume-des-Morts, with some buttons of a calcareous alabaster, in the form of a cone of which the base, slightly convex, was pierced by two holes through which a thread might be passed to fasten it to the clothing. We shall shortly see that the funeral accessories of the burial caves of Languedoc are the same as those of the dolmens of southern France, which are contemporary with these same caves.

Burial Caves of la Marne.—The burial caves of la Marne have been hollowed out of the chalk by the hand of man with flint implements, traces of which may still be seen upon the walls. In those larger caves which served as dwelling-places before being used as burying grounds, several carvings in bas-relief and some rude pottery have been found. The bodies were either completely exposed or covered with a layer of ashes not less than a yard and a half or two yards deep. The former were in a horizontal position, the latter crouching. A certain number of the bones were carbonised or calcined. These tombs belong to the latter part of the neolithic age.

III. REMARKS UPON THE BURIAL PLACES FOUND IN THE CAVES.

The full details we have given incontestably show that the caves of all prehistoric ages have been used as places of burial. But it would be a great mistake to suppose that the human bones found therein are in all cases contemporary with the bones of animals associated with them. Yet errors of this kind have been committed, even by men who are justly considered as authorities upon this question. For instance, M. Ed. Lartet honestly believed that the man of Aurignac was coexistent with the cave bear and the mammoth found in that neighbourhood, and many others shared his opinion.

With respect to the cave of l'Herm, 'this,' says Dr.

Noulet, 'like so many other Pyrenean caves, was used as sepulchres long after the formidable carnivora of the quaternary epoch who had frequented them had been destroyed, and when the tribes who had consecrated the ground to this pious use had reached a relatively advanced stage of civilisation, since they were acquainted with the art of the potter, knew the use of bronze, and had domesticated those animals which still render us such valuable service.'[1]

Evidently, and for similar reasons, there is no longer any belief in what has been called the poetry of Aurignac, or in the funeral feast so readily admitted by certain archæologists who have made a study of prehistoric times. Moreover, when we have assigned a more recent date to these tombs, the same correction brings nearer to our own day the greater part of the human remains which they contain, and considerably modifies our views upon their palæontology, craniology, and ethnology. The study of the graves erroneously supposed to be contemporary with the subjacent quaternary stratum must therefore, if it is still possible, be begun again. In any case the warning is now given, and a careful examination of the articles contained in the caves is all that is needed for the avoiding of similar mistakes for the future.[2]

The cave of Duruthy furnishes a further proof of the extreme care necessary to determine the age of any given tomb. Judging only from the human bones found beneath the hearths, it appears to belong to the epoch of the cave bear;[3] whereas it should really be attributed to

[1] Dr. Noulet, *Etude sur la caverne de l'Herm. Mém. de l'Acad. des Sciences, inscript. et lettres de Toulouse*, vol. vi. p. 515, 1874.

[2] The list of these mistakes, if we are to rely upon the statement of M. Cartailhac, is already considerable. It includes the human bones of Bize (Tournal), of Pondus and Souvignargues (of Christol); of Cannstadt even (Jäger), and of Mosbach (Meyer), which are much more recent than was supposed. It is the same with those of the cave to which M. Ed. Dupont has given the name of Trou du Frontal (Belgium), and whose contents he wrongly likened to those of the cave of Aurignac. Bruniquel, Cro-Magnon, and even Solutré, are open to dispute. These are grave assertions, and should be considered seriously; but in my opinion, at least, the proofs are not sufficiently convincing.

[3] At Duruthy a human skull was found, with a number of flint

the intermediate epoch which separates the reindeer age from that of the dolmens, and in which the fine carving of the flints announces the near approach of the age of polished stone.

We have already spoken of the funeral feast of which M. Ed. Dufort believed he had discovered the traces in the Trou du Frontal: a mistake all the more natural that there are in the burial caves a number of hearths, as well as the broken and charred bones of animals in still greater abundance. Feasts and every meal were then held there, of which the flesh of wild animals now extinct was the chief article of diet. But these meals took place, these fires were lighted, at a far earlier date than that of the funerals, perhaps even by men of another race than those whose remains are found above the quaternary beds.

Solutré, however, forms an exception to the general rule, and it appears difficult to reconcile the circumstances connected with this cave with the law enunciated by M. Cartailhac, who goes so far as to say that 'every complete human skeleton found in the caves may be assumed, *à priori*, to be more recent than the fluvial bed in which it lies.' For in fact it is proved that at Solutré many human skeletons, entire or nearly so, are placed horizontally upon the hearths. There is nothing to show that the overlying stratum has been disturbed since the time at which they were interred; moreover this bed contains no object dating from the neolithic age, it contains on the contrary a number of bones of the reindeer, horse, and mammoth, and a number of articles of a very primitive industry. It is true that Solutré is not a cave, but merely an open-air station.

For the rest, although we ought to be extremely cautious in determining the age of the remains contained in the burial crypts, it does not follow that human remains

implements and a necklace made of teeth of the lion and the bear. But it lay in a bed which had evidently been disturbed, in a tomb overlying a fossiliferous stratum. We cannot, therefore, be certain that this skull was the contemporary of the animals of whose teeth the necklace was formed.

of the same date as the bones of extinct animals found along with them never occur in the burial caves, hollow rocks, and elsewhere. We have already cited a considerable number of examples; but in these various cases, with a few exceptions (Mentone, Laugerie Basse), the human bones were generally isolated, few in number, and scattered here and there, like those of other mammalia of extinct species and their contemporaries.

Lastly, the human skeleton found entire by MM. Massenat and Cartailhac under the heap of rocks close to the shelter of Laugerie Basse, and that discovered at Mentone by M. Rivière, and which is now in the Paris Museum, prove the synchronism of man and the reindeer towards the middle of the palæolithic age.[1]

There is then nothing to show that man did not co-exist with the *Ursus spelæus* in the cave of l'Herm, if it be true, as MM. Rames, Garrigou, and Filhol maintain, that the human bones found by them in this cave were collected not upon the surface of the soil, but some in a deep layer of undisturbed argillaceous sediment, the others below a thick crust of intact and crystalline stalagmite, and were in precisely the same condition as those of the extinct species with which they were found.

The tomb discovered by M. Noulet (the vestibule of l'Herm) is of far more recent date, and the cave of Herm, like so many others, contains remains belonging to two different epochs. As for the caves of the neolithic age, there is seldom any difficulty in assigning a date to the tombs which occur in them (*e.g.*, Saint-Jean-d'Alcas, Durfort).

IV. THE DOLMENS.

The traveller in the plains of Brittany, in the centre of France, and in the valleys of the Pyrenees, encounters,

[1] M. Rivière at first held that the human skeleton discovered by him in one of the caves at Mentone was contemporary with the cave bear whose bones were found in company with it. But the tools and ornaments which surrounded the skeleton prove beyond dispute that it belongs to a more recent age, namely, that of the reindeer, although this animal never inhabited that region. The cave of Mentone is then one of the many instances in which the subsequent disturbance of the ground may lead to considerable mistakes.

almost at every step, strange monuments, generally constructed of one or more unhewn stones of colossal size placed horizontally upon two, three, or four upright blocks,[1] and sometimes on heaps of unmortared stones, the whole covered with earth, or left exposed. These are the dolmens,[2] called also covered alleys, druidic altars, or sometimes giant tombs. According to the Baron de Bonstetten, the word dolmen is formed from the two Breton words *daul* or *dol*, table, and *men*, stone, and signifies consequently stone-table (see fig. 42).

FIG. 42. SPECIMEN OF UNCOVERED DOLMEN.

Isolated upright stones may also be observed; these are known as menhirs (fig. 43). The menhirs are enormous blocks of stone, triangular, pyramidal, or conical, a kind of unhewn or roughly squared obelisk, sometimes occurring singly, sometimes in groups or rows. In the latter case they are often in considerable numbers. The famous stones of Carnac (Morbihan), extending nearly a

[1] Six and even seven occur in the dolmens of Poitou.

[2] The words dolmen, cromlech, and menhir are purely conventional words coined by archæologists. They are borrowed from the low-Breton patois or from the Gaelic, and signify *stone-table*, *stone-circle*, and *long-stone*. But in spite of their Keltic origin, these terms are no proof that these megalithic monuments, sometimes also styled Druidic, are the work of the Kelts or Druids.

mile in length, number eleven thousand, ranged in eleven rows. The size of some of these blocks is truly colossal. The conical menhir of Lock-Maria-ker in Morbihan, for example, measures twenty yards in length, and averages two yards across. At Dol, near Saint Malo, the menhir of Champ-Dolent rises thirty feet above the surface of the

FIG. 43. SPECIMEN OF MENHIR. That of Croisic (Loire-Inférieure).

soil, and extends below it to a depth of fifteen. The dolmens are not peculiar to Brittany; they are found in other French provinces, and they also occur in the north of Europe, in the whole of the Mediterranean basin, and even in India.

These megalithic monuments may be divided into two

classes. The first includes the exposed dolmens, that is, those which are not and have never been covered with soil

FIG. 44. HINDU DOLMEN, WITHOUT TUMULUS. (After Lubbock.)

(fig. 44). The second class comprises those dolmens which

FIG. 45. DANISH TUMULUS, SHOWING THE ENTRANCE TO A DOLMEN.

are covered by a mound or tumulus often of considerable size (usually more than thirty feet high), and consist of a

burial vault, simple or divided into several compartments. Such are the barrows, the *Ganggriften* or galleried tombs of Sweden and Denmark (figs. 45 and 46), the *Hünengräber*, or giant tombs of Germany, &c.

One of the finest examples of these burial vaults, hidden beneath a mound of earth and stones raised by human hands, is that of Gavr' Innis, situated near Carnac, at the entrance of the bay of Morbihan (figs. 47 and 48). The

FIG. 46. TUMULUS, WITH INNER CHAMBER, AT UBY (Denmark).

tumulus which covers this sepulchre is 30 feet high and 390 feet in circumference. The stones which line the walls are of a very hard granite, and are carved in relief with the representation of three serpents and some so-called Keltic axes. Winding and parallel, concentric or parabolic lines, zigzags, semicircles, and ellipses are also indicated (figs. 49 and 50).

The blocks of stone used in the construction of the megalithic monuments are of enormous size. There has

FIG. 47. SECTION OF TUMULUS CONTAINING THE SEPULCHRE OF GAVR' INNIS.

FIG. 48. PLAN OF THE COVERED ALLEY OF GAVR' INNIS.

been much discussion as to the means employed by the unknown builders of the dolmens, who had at their disposal but very slight mechanical aids, in moving and placing in position masses of stone of which several are not less than twenty-one feet long by twelve wide and three deep, for example, the dolmen of Antiguera, near Malaga, in Spain.

FIG. 49. SPECIMENS OF DRAWINGS IN THE COVERED ALLEY OF GAVR' INNIS.

In many instances the megalithic tombs of Europe are surrounded by one or more circles of stones (there are as many as ten to those of Aveyron), called cromlechs (fig. 51). The dolmens of Palestine and of Algeria also present a similar feature.

Many archæologists have maintained that these monuments are always turned towards the same quarter of the heavens, but this appears to be a mistake, a preconceived

notion which must be abandoned; for M. Cartailhac has taken the bearings of the position of more than fifty dolmens in Aveyron, and finds that they face every way. This is also the case in Lozère, Brittany, and Poitou, in Algeria and Palestine.

The bodies of the dead whose bones are found in the dolmens were buried in a sitting or crouching position;

FIG. 50. SPECIMENS OF DRAWINGS IN THE COVERED ALLEY OF GAVR' INNIS.

but a few of them have been discovered lying on their backs with the head or feet turned towards the east. A number of observations combine to show that interment was preferred to cremation, but this latter custom was, however, sometimes adopted, for calcined bones are by no means rare in the sepulchres, and ashes and coal are also found.

Besides the human bones, we may mention among the funereal contents of the dolmens serpentine pendants, necklace beads of the same substance, of slate, chalk, alabaster, jet, amber, and of a kind of turquoise, and several kinds of shells (*cypræa*, *neritina*, *erato*, *pterocera*, *patella*, *dentalium*, &c.) used for ornament, and lastly discs made from the upper part of the *cardium*, and perforated for stringing. The dolmens and the tumuli also contain funeral urns, drinking cups (figs. 52 and 53), and other

FIG. 51. CROMLECH, CALLED THE ALTAR OF THE GREAT SARACEN. (Channel Isles.)

vases of tolerably fine clay, and occasionally elegant, though not very varied in form. Lance and arrow heads of various kinds of stone, and often delicately wrought, occur also, and lastly axes improperly styled Keltic. It is worthy of note as a distinctive peculiarity, that these polished axes are comparatively rare in the dolmens of the centre and south of France, while a number of magnificent specimens have been found in those of Brittany and the north of Europe (Denmark, Sweden, &c.)

It was for a long time believed that the dolmens never

contained metallic objects, but this was a grave mistake. Not to speak of the bronze ornaments found in a dolmen in the department of Lot, by M. Delpon; in Vivarais by M. de Malbos; in Lozère by M. Lalande; in Algeria by M. Bergbrugger, and above all by General Faidherbe; M. Cartailhac found in a dolmen of Aveyron (that of Boussac), a long bronze bead, through which was passed a hempen thread preserved from decay by the oxide of the metal. Two other necklace beads, also of bronze, were

FIG. 52. FUNERAL URN FOUND IN AN ENGLISH BARROW. (After Lubbock.)

FIG. 53. DRINKING CUP FOUND IN AN ENGLISH BARROW. (After Lubbock.)

still united by the connecting thread and by the rust formed at the point of contact. The present *Directeur des Matériaux* also discovered in a dolmen a bronze pendant, similar in every respect to an ornament forming part of an Egyptian necklace, to be seen in one of the glass cases of the Louvre Museum. Lastly, we are also indebted to M. Cartailhac for the discovery of red amber in some of the dolmens of the departments of Gard and Aveyron,

and that of bronze bracelets similar to those of Algeria. Similar discoveries have been made in the dolmens of Lozère by MM. Prunières and de Malafosse.

The presence of pure copper has been noticed by M. Cazalis de Fondouce in certain dolmens of Aveyron, and even in the caves of Durfort and Saint-Jean-d'Alcas, which are contemporaneous with the dolmens of the later neolithic period. According to General Faidherbe, iron abounds in the megalithic tombs of Algeria. Although it is much rarer in those of France, it is nevertheless occasionally present. The people who erected these monuments, whoever they were, saw the dawn of those two epochs to which bronze and iron have given their names. But it is time to consider what was this people (if indeed it has ever existed) by whom the dolmens were constructed. Far from regarding these monuments as Keltic, M. Alfred Maury believes them to be the work of a people whom the Kelts destroyed or conquered as they amalgamated with them. Had they been the work of the Druids of Gaul, this species of construction would have been introduced wherever that people migrated, in Europe, in India, in Africa. Moreover, it has now been proved beyond all doubt that the Druids lived at an epoch far more recent than that of the megalithic tombs. M. Renan appears to us to be nearer the truth in assuming these monuments to be the work of that primitive population which existed in France before the arrival of the great Aryan races. But how then shall we explain the presence of the dolmens in countries beyond Europe, even in America?

Bonstetten, Bertrand, and many others have had recourse to the hypothesis of the emigrations of this extremely problematic people. They have even traced the route followed by these wandering architects, but the routes indicated by such authors differ widely from each other. They are not even agreed as to the direction of the supposed emigrations, whether from north to south or south to north, and the most contrary opinions have been put forward on the subject.

According to Bonstetten the people of the dolmens,

starting from the coasts of Malabar, entered Europe through the passes of the Caucasus. Thence they spread themselves along the coasts of the Black Sea as far as the Crimea, where they divided, one stream directing its course towards Greece, Syria, and perhaps Italy and Corsica, the other northward, sweeping round the Hercynian forest. Later on these wandering tribes penetrated into Brittany and Normandy, whence they overran the British Isles, advanced towards the south of Gaul, crossed the Pyrenees, and, traversing Spain and Portugal obliquely, crossing the sea, they spread over the northern coast of Africa, and established themselves on the Egyptian frontier in ancient Cyrenia. General Faidherbe regards the shores of the Baltic as the starting-point of the dolmen builders, and Africa as their final goal. Worsäe and Desor are of opinion that the architects of the dolmens followed a course completely opposed to that indicated by General Faidherbe, that they advanced northwards from the south of Europe; an opinion which is contested by M. Cartailhac, since no bronze occurs in the dolmens of the north of France, whereas this metal is not very rare in those of the south.

It is a question whether we are to consider these monuments as the work of one and the same people, or if we ought to attribute them to various peoples, different in race and living at different epochs. On this point also the most conflicting opinions are held, and these discussions have led to no certain result, but they have widened our horizon and prepared the way for the science of the future.

Not content with inventing one or more peoples, certain archæologists and palæontologists have described in detail the race or races which, according to them, were the constructors of the dolmens. M. de Quatrefages admits two; the one of small stature, brachycephalous, remarkable for the fine texture of its bones; the other tall, dolichocephalous, with a heavy and thick cranium. Both these are found in the tombs of Borreby (Denmark). General Faidherbe represents the architects of the African

dolmens as equal and even superior in height to the tallest soldiers of the French army. 'Their skulls,' he says, 'are elongated, fine and intelligent, in a word, such as might belong to those European races who are most favoured in this respect.'[1]

On the other hand, the human bones found in many of the dolmens of France and Germany are in no way remarkable in point of size; they belonged to a race about the average of our own in height. Virchow is therefore justified in saying, speaking of the Hünengräber or giant tombs of Germany, and we may say the same of the dolmens and the tumuli of France, that 'the tombs alone are gigantic, and not the bones they contain.'

The dolmen builders appear to have attached little importance to agriculture. They possessed, however, most of our domestic animals, they could shape and polish their flints with much skill, and their pottery, manufactured without the help of the wheel, was not without a certain elegance. The arts of design were little cultivated, but were not entirely unknown, as may be seen from the geometrical figures which adorn their burial urns and even vessels in daily use; from the two human feet represented on a dolmen in the neighbourhood of Vannes, and by the axes engraved or carved in strange groups on the dolmens of Loc-Maria-Ker, of Gavr' Innis, and of Mannéer-Hroek (Morbihan). Leaves of the oak and fronds of fern are represented with these axes, which, in the opinion of M. Faultrier, might have been sacred emblems intended to assure the inviolability of the monuments on which they were drawn.

In spite of the differences of opinion existing among French and foreign archæologists, nothing seemed better established or more generally adopted than the existence

[1] According to the savant whom we have just quoted, the ethnical characters of the African dolmenic race reappear among the modern Berbers and Touaregs, who are the descendants of the Tamahous or Tambous, the fair-skinned, blue-eyed invaders who inhabited the shores of Libya under the Ramaeses, and whose type is easily to be recognised, it is said, in the paintings which decorate the royal tombs in the famous Thebes with a hundred gates.

of a people who invented such singular edifices as the dolmens, a people which was formerly spread over almost every part of the habitable globe. And now, in spite of all that has been written upon the subject, the reality of this existence is strongly contested, and even formally denied, by a savant who has especially devoted himself to the study of prehistoric man. As there is a natural transition from the dolmen containing a stone coffin to the sarcophagus formed of four upright stones roofed with a fifth slab, so there is the same transition from the burial cave to the ordinary dolmen.

Arguing from these premisses, M. de Mortillet concludes that the existence of a people of builders of the dolmens is a pure hypothesis ('Revue scientifique,' August 29, 1874, p. 199). The author adduces the following arguments in support of this theory:—

1. The differences presented by the dolmens of different countries, and even of different parts of France. If they were the work of a single people they would, on the contrary, be very similar, if not identically the same in construction. Now in Brittany these monuments consist of single chambers which are entered only through long passages. Near Paris they are long, wide, covered alleys, with a very short vestibule. Finally, in the centre and south of France they are merely rectangular chests formed of four or five colossal stones.

2. Whatever analogies they may present, the dolmens do not stand alone; they form part of a great whole, they are akin to the burial cave of which they are the artificial imitation, and they are used for the same purpose. This imitation is practised by a number of different peoples who have nothing in common, excepting that they had all ceased to be nomadic and had adopted the same rites.

3. The identity of these customs, to which the dolmens and the burial caves upon which they were modelled were devoted, is further proved by the similarity of the funeral furniture of the tombs (for example, the cave of Saint-Jean-d'Alcas and the dolmens of Aveyron), and even by the hybrid character of these caves, which in the de-

partment of Var (caves of Cordes and Castellet) partake at once of the character of the dolmen and of the cave hollowed by the hand of man with a similar object to preserve and do honour to the bodies of the dead.

4. A further confirmation of the intimate connection existing among the three kinds of burial places (natural and artificial burial caves and dolmens), is the singular practice adopted severally in each of them, the custom of removing a disc of bone from the skull of the dead, and even of the living subject.

The principal facts which lead M. de Mortillet to believe that the dolmens were built by peoples differing from each other, but in no sense migratory, are the diversity in the mode of construction of the dolmens, diversity of form and proportion in the human remains found in them, and the similarity of these remains in each district with those of the palæolithic ancestors. The similarity observed in the contents of the tombs, whether dolmens, natural or artificial caves, proves that the former are, so to speak, the successors of the others, that they were nearly contemporary with them and were destined to the same purpose. MM. de Quatrefages and Broca, who formerly studied the ethnological character and the migrations of the supposed dolmenic people or peoples, have now adopted without reserve the opinion of their learned colleague. On the other hand, the remarkable recurrence of the megalithic monuments in all quarters of the globe would also seem to sanction the opinion held since 1869 by Mr. Westropp and M. Bastian. They hold that this wide diffusion is not due, as M. de Mortillet believes, to an instinct of imitation strengthened by necessity, but to a fundamental psychological principle, which manifests itself, as it were inevitably, as soon as the tribe has attained to a certain degree of intellectual development, and is produced everywhere with certain modifications due to the variation of customs, beliefs, and the materials employed.

The association of ideas, the need of giving to them a natural and sensible expression, the desire of perpetuating the memory of an important event, such would be the

entirely psychological explanation of the origin of the monuments in question, whether the *obos* of the Mongols, the *kurgans* of Siberia, the *tumuli* of the mound-builders, or the *cromlechs*, the *peulvans*, the *dolmens*, and the *menhirs* of Brittany, India, and Africa.

But it is a waste of labour and unprofitable to science to seek for a special people of dolmen builders, to endeavour to trace its wanderings, and to determine its ethnical character, if no such people exists, or has ever existed. This is the opinion of M. Bastian and Mr. Westropp, founded upon considerations very similar to

FIG. 54. PLAN OF A GIANT TOMB OF SARDINIA. (After the Abbate Spano.)

FIG. 55. MONOLITHS OF THE GIANT TOMBS OF SARDINIA OF THE EARLIER EPOCH.

those which influenced M. de Mortillet. It does not entirely solve the question of the origin of the dolmens, but perhaps it prepares the way for a speedy and satisfactory solution.

V. THE GIANT TOMBS OF SARDINIA.

Sepolture dei giganti (tombs of the giants) is the name by which sepulchres similar in construction to the nuraghi near which these tombs are invariably found (see page 126), are still known to the peasants of Sardinia. They resemble nuraghi laid horizontally (see figs. 54 and 56).

They resemble a kind of amphitheatre formed of one or two rows of roughly hewn blocks of stone (fig. 54). In the midst rises a tall conical shaft, rudely shaped (figs. 55 and 57), in which a hole one or two inches square is made about half way between the base and the summit of the cone, and another also square or in the

FIG. 56. NURAGO, SITUATED NEAR A GIANT TOMB.
(After the Abbate Spano.)

form of a half circle near the top. Sometimes the column does not consist of a single stone, but is formed of two stones placed one above the other. Behind the monolith lies the burial place, ten to fourteen yards long by one or two in width. It is composed of rough blocks forming a wall of three, four, or six rows of stones placed in steps,

FIG. 57. MONOLITHS OF THE SARDINIAN TOMBS OF THE LATER EPOCH.

sloping inwards towards the top, and roofed by great slabs two or three yards wide. In fact no better name could be found for these tombs than that given them by the vivid imagination of the people, of giant sepulchres.

The floor of the sepulchres is formed by a layer of small stones, above which larger ones, polygonal or unhewn, are placed. It may therefore be presumed that the corpses

were not covered with earth, but simply deposited in a tomb of six feet or more in depth. Like the nuraghi, near which they are always found, some of these tombs (those constructed of unhewn blocks of stone) seem to belong to the earlier age of stone; others, composed of stones more or less rudely hewn, and some of superior masonry, date from the neolithic age, or even from the epoch of transition between stone and bronze. Most, if not all, of these tombs, have been repeatedly rifled by treasure seekers at different times, so that the researches of the Abbate Spano have not been very productive. He only discovered in them a few broken and calcined human bones, which crumbled to dust at the lightest touch, and several clay vases, of which not a single one was entire. But he was satisfied that several bodies had been buried together in the same tomb, and that these were therefore family burial places. When the death of one of the members of the tribe occurred, one of the great transverse stones which covered the long alley built behind the monolith was removed, and then replaced until the time came for another body to claim its place in the tomb. The monolith, called by the Sardinian peasants *pietra dell' altare*, or altar-stone, because they believe it to have been used for human sacrifice, always faces the south or east. This is the case with the entrances of all the nuraghi. The Abbate Spano attributes the giant tombs of Sardinia to the same epoch as the nuraghi, that is to say, to the time of the earliest immigrations from the East, but many of them are evidently of earlier date.

CHAPTER VII.

PREHISTORIC MAN IN AMERICA.

M. ALBERT GAUDRY and Mr. Marsh maintain that the vast continent discovered by Columbus is not really as recent as it is generally said and supposed to be, and I am inclined to be of their opinion. A number of incontestable proofs justify this opinion.

The Indian redskin living in a state of barbarism at the time of the conquest cannot be called the primitive American. Nor were the luxuriant forests where he hunted his prey truly primæval, for they were preceded by other forests, which themselves did not deserve the name of virgin, since they had already been trodden by the foot of man, whose remains lie buried beneath their own. At New Orleans, on the banks of the Mississippi, an entire human skeleton was found buried beneath four ancient forests. Dr. Dowler attributes an age of 57,000 years to these remains. We cannot guarantee the accuracy of these figures, but if this single fact were established beyond dispute, it would in itself be a sufficient proof of the great antiquity of the human race in America.

Other discoveries of no less weight corroborate our opinion. A pelvis was found near Natchez in the *loess* of the Mississippi valley, in company with the *mastodon* of the Ohio, the *megalonyx* of Jefferson, and other species long since extinct. Human bones were extracted by Agassiz from a calcareous conglomerate which forms part of a coral reef in Florida, and of which the learned professor estimates the age to be more than 10,000 years. If these proofs are not enough, we may

mention in addition the human remains found by Lund in the caves of Brazil, with those of the *glyptodon*, the *megatherium*, and a number of fossil animals with whom man was contemporary; and the recent discovery of a human skull picked up at Jacksonville, on the banks of the Illinois, 100 feet above the present level of the river, and remarkable, like that of Neanderthal, for the deep grooves made by the muscles, and the prominence of the bones above the orbits.

Lastly, at a depth of about nine feet below the surface of the soil, in the pampas of Mercedes, near Buenos Ayres, some human bones were recently found in company with rudely carved flints and remains of extinct species (*Eutatus*, *Hoplophorus*, *Reithrodon*, *Hesperomys*, &c.). In one of the layers overlying the above mentioned one, bones of the *mylodon* and of the *glyptodon* were also found.[1]

The products of the industry of this race, which may really be termed *primitive*, resemble in almost every respect those of European man in the height of the stone age; only instead of flint, rare or absent in certain districts of America, the Indian used granite, syenite, jade, porphyry, quartz, and especially obsidian, a vitreous rock which abounds in Mexico and elsewhere. Splinters of this rock, skilfully obtained by means of percussion, were employed for the fabrication of knives sharp as razors, of arrow and lance heads, fish-hooks, harpoons, in a word of numerous implements similar to those used in Europe by the contemporaries of the mammoth and the cave bear. It is worthy of note, however, that neither axes nor stone hammers piereed with a hole for the handle, have hitherto been found in America. Some of these stone implements are merely more or less rudely carved; some are perfectly

[1] I am indebted for the knowledge of this important discovery to the kindness of Mr. Cope of Philadelphia, who has done me the honour of sending to me, with other extremely interesting works of which he is the author, a pamphlet published in December, 1878, in which the learned American palæontologist gives, after the drawing of Professor Ameghino, a section of the stratum in which the fossil man of Mercedes was found, and also a list of the extinct animals whose bones were mixed with his.

polished, such as the fine axes of green jade found in the country of the Carabees, which are now in the Museum of Antiquities in Copenhagen. Some of these implements are of very uncommon form, and we see in these the art of shaping by percussion carried to a wonderful degree of perfection. Such are for instance the flints of which we borrow the drawings from Dr. Wilson ('Prehistoric Man') and of which one is a weapon toothed like a saw, pointed

FIG. 58. FLINT WEAPON, POINTED AT BOTH ENDS, TAKEN FROM A CAVE IN HONDURAS.

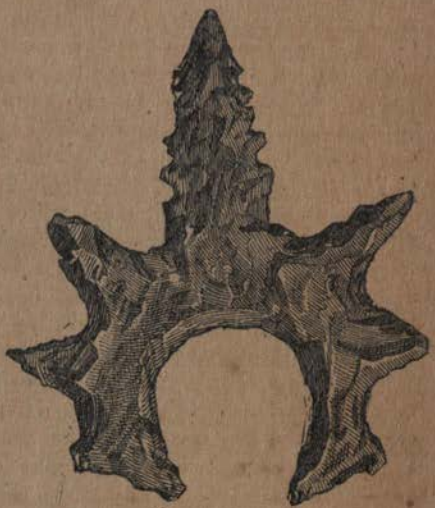


FIG. 59. FLINT HALBERD, IN THE FORM OF A CRESCENT, FROM A CAVE IN HONDURAS.

at either end, and measuring more than sixteen inches in length; the other is in the form of a crescent furnished with jutting points, and somewhat resembling certain halberds of modern date (figs. 58 and 59). These two specimens of the primitive art of the New World were found in 1794 in a cave of the Bay of Honduras. But the most striking feature in the primitive weapons and tools found in America is, we repeat, their perfect resemblance with those of the European caves; they present the

same forms, only a little less varied, and served consequently the same purposes. The work of man in these widely separated epochs offers in both worlds the most perfect analogy. We are therefore forced to conclude that the age of stone is not the peculiar apanage of any one people, but that it represents a stage in human culture which at periods more or less remote occurs in every part of the earth.

Articles of the toilet and ornaments, and some fragments of pottery, evidently dating from the prehistoric epoch, have been found in Mexico and other parts of the American continent. Obsidian beads, intended to be suspended from the lips, pearls, perforated teeth and shells for necklaces or for ornamenting the dress, clay buttons baked or dried in the sun, round mirrors of pyrites, &c. &c., all of great geological antiquity, were also found in different parts of the continent, which we persist in calling the New World. Its extinct fauna and flora also combat this theory, and the great number of different races scattered over the surface of the same continent, and the still greater variety of dialects and languages, which number more than twelve hundred, are proofs sufficient to establish and confirm our opinion.

The study of the American monuments would, if we could undertake it, furnish new proofs in favour of the great antiquity of man in the New World. Without counting the palaces whose magnificent ruins astonish the traveller, and the cyclopean constructions, similar to the European monuments very incorrectly styled Pelasgic, the mounds of Ohio and Yucatan furnish very valuable treasures of great interest to archæology. Some details respecting these mounds, which were intended for different purposes, must find place here. But we must first say a word or two about the Chulpas.

I. THE CHULPAS OF PERU AND BOLIVIA.

Burial places dating from a period anterior to the Incas, and resembling the dolmens and cromlechs of the European continent, and the nuraghi of Sardinia, are

found in Peru and Bolivia. They are there known under the name of *Chulpas*. They are burial crypts built of great upright stones, supporting the enormous slabs which form the roof. Other chulpas, of more recent date than the former, are surrounded by a wall built in the figure of a square or a circle, of which the height varies from 30 to 100 feet, a species of tower, narrowed at the base and slightly enlarged towards the summit, which is terminated by a cornice in the case of a square tower, and by a rounded dome when it is circular. The stones of which these monuments are built are usually hewn on the outer face of the building, and are held together by means of a stiff clay. Other Peruvian chulpas, built of unhewn stones, are plastered over with stucco and painted both outside and inside.

As a rule these tombs contain only one burial chamber, or sometimes two placed one above the other, and vaulted. More or less numerous niches in a single or double row, and hollowed in the thickness of the wall, were destined for the reception of the dead bodies, which were placed in a sitting or crouching position.

These monuments, whether simple dolmens, cromlechs, or burial towers, which are scattered over the vast plateau of the Andes, are the work of a single people, who gradually improved with time; their primitive civilisation seems to have passed through stages analogous to those of the builders of the megalithic monuments of the Old World, which appear to have served them as models. This strange people was probably indigenous, and held the land previous to the arrival of the Incas.[1]

II. THE MOUNDS AND THE MOUND BUILDERS.

We must attribute to the prehistoric ages of the New World a series of strange monuments, of varied form and gigantic size, the work of a people of mysterious origin and unknown race, usually designated by Anglo-American savants as mound builders. These mounds, species of

[1] For fuller details see E. G. Squier, *The Primeval Monuments of Peru, compared with those in other parts of the World. American Naturalist*, p. 518. Salem, 1870.

artificial hills, are great earthworks, often mixed with stones, destined, some of them, to serve as military defences or as sacred enclosures; others are crowned with temples; others, again, were consecrated to the burial of the dead or to religious rites; lastly, some served the purpose of look-out posts.

These artificial constructions, which at the first glance may easily be mistaken for natural hills, are scattered in profusion throughout Wisconsin, Illinois, and especially in the rich valleys of the Scioto, the Ohio, and the Mississippi. They are sometimes isolated and sometimes they occur in groups; usually circular and occasionally elliptical in form, they sometimes represent the figure of animals, and even of man, while a few imitate the form of inanimate objects, among which occur pipes of gigantic size. It is worthy of notice that all the geometrical figures are perfectly regular, even circles of 1,000 feet in diameter, and they seem to have been traced according to a scale of which the proportions were determined with accuracy and faithfully executed. The following examples will be sufficient to give an idea of their dimensions.

According to Messrs. Squier and Davis, to whose magnificent work [1] we are indebted for the following details, some of these artificial hills measure not less than 550,000 cubic metres, so that it is calculated that four of them would be greater in bulk than the largest of the Pyramids of Egypt, the volume of which is said to be 2,000,000 cubic metres. The truncated pyramidal mound of Calokios, in Illinois, measures, according to Lubbock, 700 feet long by 500 feet wide and 90 feet high. Its total volume is estimated to be 20,000,000 cubic feet.

These monuments have yielded to the researches of archæologists treasures as valuable as they were unexpected. Their age is unknown; but many of them date, it would seem, from a period anterior to the neolithic age of the New World, since they contain weapons of unpolished aphanite, a species of greenstone, resembling in form and

[1] Squier and Davis, *Ancient Monuments of the Mississippi Valley. Smithsonian Contributions to Knowledge*, vol. i.

workmanship the flint axes and arrow heads of Abbeville and Amiens. But for the most part, side by side with these rudely shaped stone implements, others are found so well polished that they will bear comparison in this respect with our most skilfully wrought flints, a circumstance which seems to indicate that the archæolithic and neolithic ages are less distinct in America than in Europe. This opinion is further confirmed by the presence in most of the mounds of weapons and tools of pure copper wrought by stone hammers—a clear proof that at one time metal and stone were employed simultaneously. We refer our readers to the work of Squier and Davis for a number of interesting details about several kinds of mounds. We need only say a few words about the symbolical mounds, representing animals, and those known as sacrificial mounds, used at once as tombs and as altars for human sacrifice.

Symbolical Mounds are numerous in the State of Wisconsin, but rarer in the valleys of the Ohio and of the Scioto. The characteristic feature of the symbolical mounds is that they represent almost exclusively the image of man and of certain animals, and sometimes gigantic pipes. Turning to account the undulations of the prairies, the prehistoric architects of Wisconsin modelled those immense bas-reliefs which faithfully reproduce the outlines of the bear, the fox, the otter, the glutton, the elk, the buffalo, the eagle, the tortoise, the lizard, the frog, &c. Man himself, as we have said, figures in these strange groups. Earthworks in the form of a cross or a crescent, and other geometrical figures, occur also, and the battle-axe is sometimes represented.

Among the most famous of the symbolic mounds we will mention two, which for several reasons deserve special notice. The one situated in the Mississippi valley bears the name of Alligator Mound; the other, known as the Great Serpent Mound, occupies the extreme point of a tongue of land formed at the junction of two rivers which flow into the Ohio. The first of these animals, designed with considerable skill, is no less than 250 feet in length

from the tip of the nose to the extremity of the tail. Excavations made in various parts of the figure show that the interior is formed of a heap of stones, over which the form has been moulded in fine, stiff clay. The Great Serpent is represented with open mouth, in the act of swallowing an egg of which the diameter is 100 feet in the thickest part; the body of the animal is wound in graceful curves, and the tail is rolled into a spiral. The entire length of the animal is 1,000 feet. This work is unique in the New World, and there is nothing on the old continent which offers any analogy to it. It has given rise to a number of absurd theories, not only on the part of the present savage inhabitants of America, who believe this symbolic serpent to be the work of the great Manitou, but also among modern savants, who consider the symbol to be akin to, or even the parent of, certain superstitions which reign in Egypt, in Assyria, and in Greece, and of which the traces still remain upon the temples of India, of Central America, and even upon the megalithic monuments of Avebury and of Carnac.

Funeral Mounds.—The dimensions of these mounds seem to bear an exact proportion to the rank of the individual whose remains they cover. Each contains one or more chambers, the roof being supported by enormous beams, covered by the earth and stones which form the tumulus. The body usually reposes in a sarcophagus, of which the sides are formed of rudely squared logs of wood, and the bottom consists of thin planks, which time has decayed, and their dust is mingled with that of human bones. The latter are so fragile that they break and crumble to dust at the slightest touch. The sarcophagus is sometimes made of unhewn stones placed upright, and the body is enveloped in a shroud of bark, or covered with plaques of mica. Bone necklaces, consisting of one or two rows, tools, stone or pure copper urns, and perforated discs of this metal, form the principal contents of the tomb. They generally lie among ashes, charcoal, and half-charred bones—a certain proof that cremation as well as interment was practised by the mound builders,

and that they sacrificed human victims on the tombs of their chiefs, a custom, moreover, which at a later period was common among the Mexican Aztecs, and among the Peruvians of the time of the Incas.

Lewis Morgan found some blades of flint ranged side by side like teeth over a space of about two feet in length, in an Iroquois mound. He supposes, and I am inclined to agree with him, that these flint knives had been originally fixed with bitumen and fine cord in a groove made in the edges of a sword-shaped piece of wood. We cannot fail to see that this description answers exactly to that of the *magahuitl* or primitive sword of the early inhabitants of Mexico and Yucatan. The ancient Mexicans, however, instead of arming the wooden sword with flint teeth, used blades of obsidian (itzli) as sharp as razors, which made it a terrible weapon of war. (See Dr. Wilson, 'Prehistoric Man.')

Sacrificial Mounds and Altars.—Certain mounds are distinguished from the rest by special features which leave not the smallest doubt as to their original destination. The mounds in question are nearly always found within the sacred enclosures; they are built up of alternate layers of gravel, mould, sand, and slices of mica, and they usually cover an altar of stone or baked clay, hollowed into the form of a basin, on which were deposited offerings of various kinds, nearly all bearing the traces of the prolonged action of fire.

Obsidian knives, thin slices of mica cut into graceful curves or geometrical figures, others thicker, round or oval in shape and perforated for stringing; necklaces made of beads and pierced teeth, and even of silver; ear-rings and armlets of finely polished bloodstone; pendants and other badges of distinction of different shapes and materials, and beautifully wrought; lance and arrow heads made of quartz, obsidian, flint, and even of manganesian garnet; implements of pure copper; bone and ivory needles; fine and rude pottery; carved stones and pipes, sometimes ornamented with beads; the whole intermixed with a quantity of ashes, charcoal, calcined shells, human bones broken and

half consumed, and the remains of garments completely carbonised, in which the web of the tissue is still distinguishable; such are the usual contents of the basin-shaped altars in use among the ancient inhabitants of the valleys of the Ohio and the Mississippi. Sometimes the sheets of mica, so common in the tombs and the sacred basins, are circular and overlap each other like the scales of a fish, and represent together the figure of a crescent. Hence it has been somewhat rashly assumed that the mound builders worshipped the moon.

Another and probably truer conclusion is that the pipes carved in stone which are found in quantities upon the altars, even to the exclusion of all other offerings, are a proof of the use of tobacco in religious ceremonies from

FIG. 60. STONE PIPE FROM ELLIOTT'S MOUND IN OHIO.

the time of the mound builders. They imagined that the scent of this narcotic plant was agreeable to the Great Spirit: they smoked its leaves in his honour. The pipe was the censer, and the smoke the incense. Some of these pipes are of soft stone (steatite, chlorite, clayey schist, ferruginous sandstone, calcareous stones), the others of clay. They vary considerably in size and form. They represent for the most part the figures of animals, especially birds, often also that of man more or less caricatured (fig. 60). Some of them have a tube connected with the bowl of the pipe, others are without it; and the opening destined for the passage of the smoke is so narrow that a straw or very fine tube can with difficulty be introduced

into it. The larger and more ornamented ones have received the name of *calumet-pipes*, and were probably employed on solemn occasions and in great religious ceremonies. Lastly, there are the *portrait pipes* (fig. 61), or

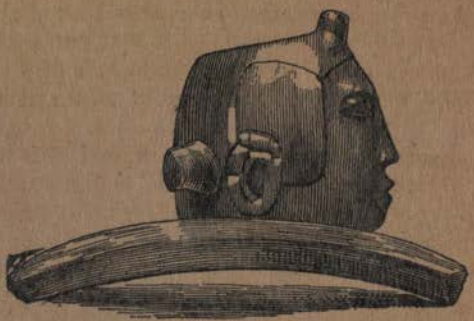


FIG. 61. SPECIMEN OF PORTRAIT PIPE FROM THE MOUNDS.

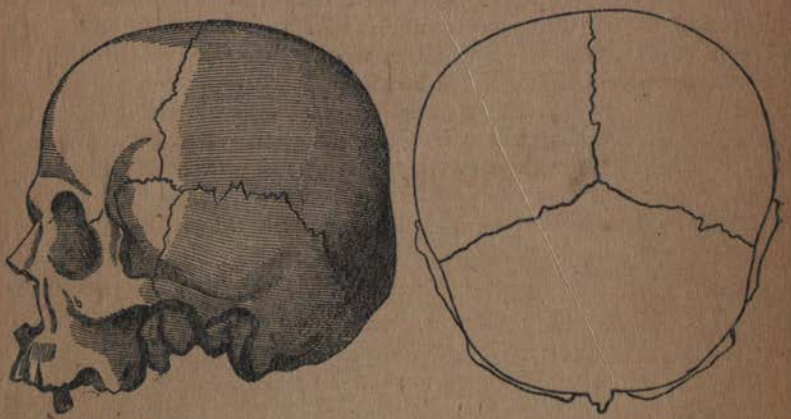
what are supposed to be such; for we may assume that the fidelity and even the talent with which the artists of prehistoric times have reproduced the animals they saw around them, are a guarantee for the accuracy of the

FIG. 62. PIPE OF THE CHIPPEWAYS.

representation of the features of their contemporaries, when they did not wish, as is often the case, to make grotesque caricatures, placing human heads upon the bodies of animals.

Thus, by a strange chance, the pipes found in the mounds and upon the sacrificial altars give us at once an idea of the fauna known to the mound builders,[1] numerous specimens of an art since practised upon a smaller scale and perhaps with less originality (fig. 62), and lastly a probably faithful representation of their racial type.

But the pipe-portraits, and even the two or three skulls found in the mounds, do not furnish sufficient data



FIGS. 63, 64. SKULL TAKEN FROM A MOUND IN THE SCIOTO VALLEY. PROFILE AND BIRD'S-EYE VIEWS.

to enable us to determine the race of the mound builders. The nearly perfect skull of the valley of Scioto (figs. 63

[1] Among the animals which the pipes represent, the following are the most common:—The sea cow, the wolf, the bear, the otter, the panther, the wild cat, the racoon, the beaver, the squirrel, the eagle, the owl, the falcon, the heron, the parrot, the crow, the duck, the rattle-snake, the frog, the toad, the tortoise, and the alligator. All these animals, with the exception of the sea cow, belong to the fauna of North America, and it is very probable that the carved pipes of which we are speaking were manufactured in the State of Ohio, and especially in the district called Mound City, because of the great number of tombs which occur there. (See Squier and Davis, *Ancient Monuments of the Mississippi Valley*. *Smithsonian Contributions to Knowledge*, vol. i.; and Rau, *The Archæological Collection of the United States National Museum*. Washington, 1876.)

and 64) offers the following characters. The vertical height is considerable; diameter from the forehead to the back is small; great width between the parietal bones, considerable depression of the occiput, forehead high and arched; prominent cheekbones, wide face, prominent nose, and heavy and powerfully developed jaws. It must remain doubtful whether this almost unique skull is, as Morton affirms, the perfect type of the conformation of the cranium common to all the tribes, ancient or modern, which have dwelt or still dwell upon American soil. As the native savages answer when the Anglo-American archæologists question them upon the history of the remote past, *Quien sabé*, 'who knows'? However, Schoolcraft assures us that the mound builders were no other than the Alleghanians, that is, the Indian tribe earliest established in the valleys of the Ohio and the Mississippi. But it is certain that previous to their coming other populations had lived in America, that here, as in Europe, man was the contemporary of species long since extinct, and therefore that here also his existence dates from geological epochs.

CHAPTER VIII.

MAN OF THE TERTIARY EPOCH.

The Human Bones of the Volcano of la Denise.—The Striated Bones of the Elephant of Saint Prest.—The Meiocene Flints of Thenay.

WE have hitherto concerned ourselves solely with the quaternary strata in our search for proofs of the great antiquity of the human race. The tertiary rocks will in their turn show unmistakeable traces of the appearance of man upon the earth as early as the meiocene and pleiocene epochs, indications which although vague are nevertheless worthy of the most serious consideration.

In 1844, M. Aymard, a distinguished naturalist of Auvergne, announced the discovery of some human remains in a volcanic breccia of the mountain of la Denise; on the other slope of the mountain, in a breccia very similar to the preceding, M. Aymard found bones of the great mammalia—the elephant, rhinoceros, stag, horse, &c., of extinct species, and even of one extinct genus, the mastodon. Hence he concludes that man was their contemporary. This conclusion was rejected by the geologists of that epoch, notably by M. Pomel, who became afterwards convinced of the co-existence of our race in Auvergne, not with the mastodons whose remains are here found for the first time in company with those of animals of the quaternary epoch, but only with the reindeer and *Elephas primigenius*. He believes, moreover, that the man of la Denise witnessed the latest cataclysm which modified the surface of the globe.

The authenticity of the human bones found near la Puy was at first contested; but it has been established, since 1859, by Ed. Lartet, Albert Gaudry, and Lyell, and previously, by the members of the scientific congress assembled at Puy in 1856.

The age alone, whether pleiocene or only quaternary, of the volcanic tuff whence the bones of the man, or rather of the two men (the one a youth, the other an adult), of la Denise were taken, has given rise to differences of opinion among geologists, some of whom maintain that these bones were contemporary with the *Elephas meridionalis*, and even with the mastodon; while others attribute them to the epoch of the reindeer and mammoth.

Many people still remember the great sensation created in the scientific world by M. Desnoyers, when, on June 8, 1863, he made known to the Institute of France his discovery of traces in the undisturbed pleiocene sands of Saint Prest, near Chartres, proving the co-existence of man and the *Elephas meridionalis*,[1] the *Rhinoceros leptorhinus*, and other extinct mammalia of the upper tertiary strata. These traces were incisions and scratches varying in form and length, which M. Desnoyers had seen upon the bones of these animals, and which he attributed to the action of a race of men still more ancient than those of the caves inhabited by the bear, and who, like the latter, possessed only rudely carved flints for weapons and tools.

The author of this communication believed he might conclude, from the facts he had observed, if not with certainty, at least with a great appearance of probability, that 'man lived upon the soil of France at the same time as the *Elephas meridionalis* and the other pleiocene species which characterise the valley of the Arno in Tuscany; that he strove for existence with those great

[1] Palæontologists distinguish three principal species of elephants: 1st, the *Elephas meridionalis*, which has been found at Chartres, and is therefore in no sense southern; 2nd, the *Elephas antiquus*, which, in spite of the name it bears, is less ancient than the preceding; 3rd, the *Elephas primigenius*, the most recent of the three. We have here a striking example of the inconvenience of too significant names in natural history.

animals prior to the *elephas primigenius*, and to the other mammalia whose remains are found in company with the vestiges of man in the transported or quaternary beds of the great valleys or of the caves; lastly, that the deposit of Saint Prest is, as far as we yet know, the earliest example in the geological period at which man co-existed in Europe with extinct species.[1]

These bold but logical conclusions were received, as might have been expected, with considerable caution, even by the members of the Institute. An odious calumny, soon condemned by public opinion, attempted to annul or to destroy the importance of the discovery given to the world by M. Desnoyers. On the other hand, M. Ed. Lartet gave it the modest and loyal support of his testimony and authority.

Sceptical men of science demanded, however, the production, if possible, of stronger proofs in support of so momentous an assertion as that of the contemporaneity of man and pleiocene species.

Another discovery, equally unlooked for, soon excited in the scientific world an interest equal to that created by the communication made by M. Desnoyers to the Academy, namely, that of the carved flints (arrow heads and scrapers) found beneath the meiocene deposits of Thenay, in the department of Loir-et-Cher. However extraordinary and unexpected this new discovery might appear, the Abbé Bourgeois asserted it as a fact without the smallest hesitation before the Prehistoric Congress assembled at Paris in 1867. 'The presence of carved flints at the bottom of the chalk in Beauce,' says the learned abbé, 'is a remarkable fact, and hitherto without precedent; but it is in my opinion authentic and of great importance.' He even attempts to trace, by means of data collected on the spot, the order of the appearance of the various species which succeeded each other in Beauce and Orleanais after the

[1] J. Desnoyers, *Sur les indices matériels de la coexistence de l'homme avec l'elephas meridionalis dans un terrain des environs de Chartres plus ancien que les terrains de transport quaternaires des vallées de la Somme et de la Saône.* (*Comptes-rendus de l'Institut*, 8 juin 1863.)

date of the flints found below the meiocene beds in these districts. 'On the shores of the lake of Beauce,' he says, 'man lived in the midst of a fauna which completely disappeared (*aceratherium*, *tapir*, *mastodon*). With the fluviatile sands of Orléanais came the anthropomorphous monkey (*pliopithecus antiquus*), the *dinotherium Cuvieri*, the *mastodon angustidens*, the *mastodon tapinoides*, the *mastodon Pyrenaicus*, &c. These species, which probably persisted during the epoch of the shell deposits, then made way for the quaternary fauna which I found near there in the breccia of Villiers (*rhinoceros tichorhinus*, *hyæna spelæa*, *felis spelæa*). Lastly, it was succeeded by the contemporary fauna.'[1]

In spite of these distinct assertions of the learned abbé, his meiocene flints inspired in Paris and elsewhere an almost universal distrust, and they met with no better reception at the Prehistoric Congress held at Brussels in 1872. While Worsaë, Englehardt, Waldemar, Schmidt, Capellini, De Quatrefages, De Mortillet, Hamy, and Cartailhac are inclined to see upon some of them the traces of human handiwork, Steenstrup, Virchow, and Desor cannot recognise upon these stones the indication of any work whatsoever, Van Beneden declares that he can come to no decision, and Hébert absolutely denies all belief in them.

On the other hand, M. de Mortillet says: 'The flints of Thenay bear unmistakeable trace of the work of human hands. . . . And, moreover, the specimens bear in themselves the seal which denotes their origin and their authenticity. They are made of a species of flint totally different to that found on the surface. It is impossible to confound them. Besides, as I have already said, the means employed in shaping them were entirely different. Hitherto we have only been acquainted with the mode of chipping them by blows; those of Thenay were splintered by fire. This is a well-marked and characteristic indus-

[1] In Italy, Professor Capellini drew the same conclusions from incisions which he believed to be intentional on the bones of pleiocene *Cetai*. But the nature of these incisions is strongly disputed.

trial distinction which denotes a widely different prehistoric epoch, more ancient than the quaternary, since in the latter period percussion was universally and exclusively employed. (G. de Mortillet, 'Promenades au musée de Saint-Germain,' p. 76.)

This is all very well, but here we meet with a slight difficulty. Who kindled the fire which served to splinter the flints? Was it man himself, or the lightning from heaven? And in either case where are the cinders and the ashes?

While allowing the authenticity of the splinters of flint found by the Abbé Bourgeois, M. Albert Gaudry does not admit the existence of man during the meiocene epoch, and it must be confessed that the facts on which he grounds his opinion have considerable weight. 'There was not,' he says, 'in the middle of the meiocene epoch a single species of mammal identical with species now extant. Considering the question merely from a palæontological point of view, it is difficult to believe that the flint carvers of Thenay remained uninfluenced by this universal change.'[1] The eminent professor alludes here to the modifications which have, since the above-mentioned epoch (mean meiocene), taken place in the successive fauna and in the geological phenomena.

'After the fauna of the chalk beds of Beauce and of the shell deposits, came that of the upper meiocene beds of Eppelsheim, of Pikermi, and of Liberon, which differs from it. The fauna of the lower pleiocene of Montpellier, that of the pleiocene of Perrier, of Solilhac, of Coupet, succeeded that of the upper meiocene beds. Afterwards followed the epoch of the forest beds of Cromer, succeeded in its turn by the glacial epoch of the boulder clay, which endured a long time, to judge from the Norfolk deposits; the epoch of the boulder clay was followed by that of the diluvium; then came the reindeer age; and, lastly, the present geological age.' (Albert Gaudry, p. 240.)

We very well understand M. Gaudry's disbelief in

[1] Albert Gaudry, *Les enchaînements du monde animal dans les temps géologiques*, p. 240, Paris, 1878.

man of the meiocene age, since we are not ourselves entirely convinced on this head; but he will doubtless permit us to differ from his opinion that the famous Thenay flints were carved by the *dryopithecus*.

The question of tertiary man (meiocene or pleiocene) is not as yet completely solved: 'Adhuc sub judice lis est;' but in my opinion there is nothing impossible in this hypothesis. Since two anthropomorphous monkeys (*pliopithecus antiquus* and *dryopithecus fontani*) could live, the one at Sansan in the department of Gers, the other at Saint Gaudens in Haute Garonne, as early as the meiocene epoch, I do not see that there is sufficient reason for denying the existence of man during this same epoch either in Beauce or Orléanais or in Languedoc. But in such questions proof by analogy cannot supply the place of direct proof, and the latter is not hitherto forthcoming.

CHAPTER IX.

THE GREAT ANTIQUITY OF MAN.

ALL nations have an innate tendency to attribute to their race a great antiquity. Thus the Arcadians styled themselves more ancient than the moon, *προσέληνοι*, and the inhabitants of Attica boasted that they were created before the sun.[1]

The idea that the human race had giant ancestors is also widely spread. The bones of the mammoth and mastodon, long mistaken for human remains, seemed to confirm this most erroneous opinion. A still greater and more deplorable error was the attributing these bones to saints, and as such they were paraded with great pomp through the towns and in the country as late as 1789, in the hope of thereby obtaining rain from heaven in years of prolonged drought.

Everyone knows the audacious imposition practised by a certain Mazoyer upon his contemporaries, including Louis XIII. of France. He pretended that the bones of a mastodon, found in 1613 near the château of Chaumont in Dauphiné were the remains of the giant Teutobochus, king of the Cimbri, who after having invaded Gaul, were conquered by Marius in the neighbourhood of Aix in Provence.

All the science and discernment of Cuvier were needed to show in the clearest way that the pretended *homo diluvii testis* of Scheuchzer, found in 1725 in the clayey

[1] Ante Jovem genitum terras habuisse feruntur
Arcades, et luna gens prior illa fuit.
Ovid, *Fasti*, ii. vv. 289–290

schist of Œningen in eastern Switzerland was nothing but a gigantic salamander.[1] It is hardly worth while to mention the petrified horseman of the forest of Fontainebleau which led astray the imagination of lovers of the marvellous rather than of the truth.

The great antiquity of the human race is at the present day established beyond dispute by proofs of a less doubtful character; we may even say that there is a superfluity of such proofs. Not to mention the well-known but still somewhat dubious jawbone of Moulin-Quignon, or the carved flints of the diluvium at Abbeville and elsewhere, the bones of extinct animals bearing undeniable marks of wounds made by man, or traces of human work; the remains of our species intermixed with those of extinct species, in the tombs, the caves, the osseous breccia, and the lava of ancient volcanoes, or accompanied with the vestiges of a very primitive industry; the total and prolonged ignorance of the use of metals; the changes which have taken place in the conformation of the earth's surface since the first appearance of man; there are certainly more proofs than are necessary to convince even those who close their ears most obstinately to the accents of truth. To these proofs we have nevertheless added others drawn from traditions, monuments, the degree of civilisation attained by the nations who constructed them, even from historical chronology, though the time which has elapsed since the earliest dawn of history is but an instant compared with eternity. For what are the 7,000 years which have elapsed since the foundation of Thebes with its hundred gates? What are the 5,000 or, at most, 6,000 years admitted by archæologists as the age of the pyramids and the statues of Schafra and Ra-em-ke? Of what account even are the sixty-six centuries attributed to the great pyramid of Sakkara? All these dates, supposing them to be accurate and established by proof, are nothing

[1] Scheuchzer, at once a naturalist and a theologian, accompanies his description with the following pious exhortation:—

'Betrübtes Beingerüst von einem alten Sünder,
Erwache, Stein, das Herz der neuen Bosheitskinder.'

in comparison to the geological ages during which European man left the traces of his dawning industry and even his own remains which we find in the diluvium of the caves and valleys, perhaps even in the pleiocene and meiocene strata of the tertiary beds.

However, we are far from reposing blind faith in those rash or at least premature calculations, by means of which certain geologists would determine in more or less plausible figures the date of the first appearance of man on the earth or the respective durations of the ages through which he passed in Europe as he gradually emerged from a state of complete barbarism to the advanced civilisation he has now attained.

Since, as the most distinguished among our learned men avow, science is as yet unable to determine the precise dates of events which took place in the earliest times of Egyptian history, since they tell us that fifty years ago not a word of this history was known,[1] it is rash to endeavour to reconstruct as a whole the early archives of the human race, and to believe that we possess all the records indispensable to the execution of so difficult and so gigantic a work.

It matters little whether man has inhabited the earth for 100,000 years, as a well-known geologist maintains, or for as many centuries, as others are inclined to think. But from the results of our researches, and from discoveries whose authenticity has been proved by the strictest examination, we can now draw conclusions of immense value, and of which the certainty can no longer be denied.

From the country now known as Picardy, the ancient inhabitant of Abbeville or Amiens could pass into Great

[1] In making soundings in the slimy soil of the Nile valley, two baked bricks were discovered, one at a depth of twenty, the other of twenty-four yards. If we estimate the thickness of the annual deposit formed by the river at eight inches a century, we must assign to the first of these bricks an age of 12,000 years, and to the second that of 14,000. By means of analogous calculations, Burmeister supposes seventy-two thousand years to have elapsed since the first appearance of man upon the soil of Egypt, and Draper attributes to the European man who witnessed the last glacial epoch an antiquity of more than 250,000 years.

Britain without crossing the Channel. The British Isles were united to Gaul by an isthmus which has been since submerged. The level of the Baltic and of the North Sea was 400 feet higher than it is at the present day. The valley of the Somme was not hollowed to the depth it has now attained; Sicily was joined to Africa, Barbary to Spain. Carthage, the pyramids of Egypt, the palaces of Uxmal and Palenque were not yet in existence, and the bold navigators of Tyre and of Sidon who at a later date were to undertake their perilous voyages along the coasts of Africa, were yet unborn. What we know with certainty is that European man was contemporaneous with the extinct species of the quaternary epoch (*elephas primigenius*, *rhinoceros tichorhinus*, *ursus spelæus*, *felis spelæa*, &c.), that he witnessed the upheaval of the Alps and the extension of the glaciers, in a word, that he lived for thousands of years before the dawn of the remotest historical traditions.

It is even possible that man was the contemporary of extinct mammalia of species yet more ancient than those just mentioned, that is of the *elephas meridionalis* of the sands of Saint Prest, or at the least of the *elephas antiquus*, assumed to be prior to the *elephas primigenius*, since their bones are found in company with carved flints in several English caves, associated with those of the *rhinoceros hæmitechus* and even of the *machairodus latidens*, which is of still earlier date.

M. Ed. Lartet is also of opinion that there is nothing really impossible in the existence of man as early as the tertiary period. The incisions observed upon the bones of the *elephas meridionalis* by M. Desnoyers, perhaps even those remarked by the Abbé Bourgeois upon the carved flints of la Beauce, tend to this conclusion. But in the absence of more numerous facts and of more decisive proofs we are forced to suspend our judgment until we are more fully informed. Let us give a few moments' attention to the words of an extremely orthodox savant, M. F. Lenormant, a sincere Catholic. He says: 'But it will be doubtless objected to by some people, alarmed at

the audacity of these assertions to which the public is not yet accustomed, and which are nevertheless regarded as indisputable by men of science: "How can you make your Egyptian dates agree with the Bible, with the 4,004 years which the Scriptures assign as the lapse of time between the creation of man and the coming of Christ, with the 2,348 only which they count between the deluge and the Incarnation?" Many people would reject as valueless the authority of Moses in reply to such a question. I am not of the number. A Catholic, profoundly convinced of the truth of all that my religion teaches, I respect the Holy Scriptures, I bow to their authority, and I believe in the divine inspiration which dictated them. But many things which do not really belong to them are attributed by commentators to the Scriptures, and chronology is of the number. I do not consider myself in any way bound to accept it as an article of faith, and when I meet with positive facts which refute it, I prefer the facts to the most ingenious systems of commentators. One of the most eminent learned men of the present century, and at the same time a sincere Christian, Sylvestre de Sacy, used to say, "People perplex their minds about Biblical chronology, and the discrepancy which exists between it and the discoveries of modern science. They are greatly in error, for there is no Biblical chronology." Nothing can be truer, and Catholics as well as their opponents should always bear this in mind when they are occupied with the study of the early history of humanity. For chronology can only exist where the necessary elements occur, when we are in possession of records which control the accuracy of the figures transmitted by the chroniclers, and, above all, when we know the measure of time in use among the people whose annals we seek to reconstruct. It is no use, therefore, to seek in the Scriptures that which they cannot contain, a fixed and certain chronology.' (François Lenormant, 'L'Egypte,' p. 61.)

We repeat the statement we made at the beginning of this book:—'Science is bound to no philosophy—to no

religion. Is there a Protestant geometry, physics, and physiology, and another Catholic?'

We may add, moreover, to the honour of our century, that the Catholic Church itself, so long and so bitterly hostile to the discoveries of profane science, confirms them at the present day by the voice and the labours of her most cultivated and enlightened ministers.

A learned abbé, professor at the Sorbonne, asserts categorically that prehistoric archæology and palæontology may, without running counter to the Scriptures, discover in the tertiary beds and in those of the early part of the quaternary period the traces of *pre-Adamites*. Since it disregards all creations anterior to the last deluge but one (that which produced the diluvium, according to the abbé), Bible revelation leaves us free to admit the existence of man in the grey diluvium, in pleiocene and even in eocene strata. On the other hand, however, geologists are not all agreed in regarding the men who inhabited the globe in these primitive ages as our ancestors.' (L'Abbé Fabre, 'Les origines de la terre et de l'homme,' p. 454.) M. Fabre will I hope permit me to differ from him on this last point.

The Abbé Bourgeois, whose courage and perseverance has been recognised by M. Broca, president at the Congress of the Anthropological Sciences, has laboured during eleven years in the search for proofs of the existence of man during the meiocene epoch. Although an early death cut short his labours before he was able to see the definite triumph of his theory, rash in appearance, but nevertheless strictly logical, he was at least, says M. Broca, 'a rare and noble example of a deeply religious mind, whose faith is sufficiently firm to have nothing to fear from scientific truth.' (Speech at the opening of the Congress of the Anthropological Sciences, Paris, August 16, 1878.)

Lastly, the Abbé Brasseur de Bourbourg, doing homage also to scientific truth, expresses himself as follows on the subject of the old traditions of the New World:—'If I am to believe the records which I have been so fortunate as to discover, there are dates which allude to ancient convulsions of nature in these regions, to deluges

and terrible inundations, followed by the upheaval of mountains accompanied by volcanic eruptions. Traditions whose traces recur in Mexico, in Central America, in Peru, and in Bolivia, suggest even the idea that man existed in these different countries at the time of the gigantic upheaval of the Andes, and that he has retained the memory of it.'

Thus all the proofs that we have collected together touching the great age of the human race, and those which scientific men of every nationality are daily collecting, are it is true of unequal value, but all are in perfect agreement, and most of them are checked by geologists of the first rank, and judges whose competence cannot be surpassed, among whom is the eminent palæontologist, M. Ed. Lartet. He says upon this subject, 'The truth so long contested, that of the co-existence of man with the great extinct species (*elephas primigenius*, *rhinoceros tichorhinus*, *hyœna spelœa*, *ursus spelœus*, &c.), appears to me to be henceforward unassailable and definitely conquered by science.' ('Cavernes du Périgord,' p. 35.)

We repeat then, with the real founder of archæology, 'God is eternal, but man is old indeed,' even in the New World. Such is the logical conclusion of the first part of this work.

PART II.

PRIMITIVE CIVILISATION.

CHAPTER I.

DOMESTIC LIFE.

I. THE ORIGIN OF THE USE OF FIRE.

FIRE, the common source of heat, light, and life, the active agent in numberless industries, and above all in the working of metals, is beyond question one of the most precious conquests which man has made from nature. Its discovery was more than a benefit; it was a giant stride forward in the path of civilisation. With the use of fire society arose, family life and all the sacred joys of the domestic hearth; art and industry were born, with all the wonders which they have produced and are daily producing. Hence it is easy to understand that fire has been and still is among a great many nations the object of a special worship (the priests of Baal, the Brahmins of India, the vestal virgins, the priestesses of the sun in Peru, are a few examples among many), and that it has often figured in the religious and funeral rites of nations remote from each other both in time and space; for example, the Chaldeans, Hebrews, Greeks, Romans, Hindus, Peruvians, Mexicans, &c. But how and at what epoch did man arrive at this great discovery, without which it is difficult to conceive the possibility of his various arts, nay of his very existence? Did he steal fire from heaven, as the Indian and Hellenic myths tell us; or, as other legends say, did he

turn to account the spontaneous burning of the forests, the rubbing of two dry branches violently agitated by the wind; or, lastly, did he from the very beginning endeavour to find one of those simple and practical means employed at the present day by certain savage or half-civilised tribes to procure themselves the fire necessary to daily life?

In spite of a number of contrary assertions, however far we go back in the history of man we always find him in possession of fire. The fable of Prometheus, who went to seek it on Olympus itself, is no other than the Vedic myth which represents the god *Agni*, or the celestial fire, in Latin *Ignis*, as hidden in a casket whence *Matarichvan* forced him to come forth, and presented him to Manou the first man, or to Brighu the *brilliant*, father of the priestly family of that name.

The name of Prometheus himself is of Vedic origin, and recalls the process employed by the ancient Brahmins to obtain the sacred fire. They used for this purpose a stick which they called *matha* or *pramatha*, the prefix *pra* adding the idea of *robbing by force* to that contained in the root *matha* of the verb *mathâmi* or *manthnâmi*, to produce by friction. Prometheus is he who discovers fire, brings it from its hiding place and communicates it to men. From Pramanthâ or Prâmâthyus, he who hollows by friction, who steals fire, the transition is easy and natural; and there is but a step from the Hindu Prâmâthyus to the Greek Prometheus, who stole the fire from heaven to kindle the spark of life in the man of clay.

The lighting stick or *pramanthâ* was furnished with a cord of hemp twisted with cow's hair, and by means of this cord rolled round the upper part, the priest of Brahma imparted to it a rotatory motion alternately from left to right, and from right to left. The stick was turned in a little hollow formed at the point of intersection of two pieces of wood placed one above the other in the form of a cross, and of which the extremities bent at right angles were firmly fixed by four bronze nails. The whole apparatus

was called *Swastika*.[1] The father of the sacred fire bore the name of *Twastri*, that is, the divine carpenter, who made the *Swastika*, and the *Pramanthâ* whose friction produced the divine child *Agni*, in Latin *Ignis*. His mother was named Maya. He himself was styled *Akta* (*anointed*, *χριστὸς*) after the priests had poured upon his head the spirituous *Sôma*, and on his body butter purified by sacrifice.

In his interesting work upon the origin of fire ('Die Herabkunft des Feuers') Adalbert Kühn always designates the and this other similar sign by the name of *arani*, and he considers them both as the principal religious symbols of our Aryan ancestors. He adds: 'This process of kindling fire naturally led man to the idea of sexual reproduction. This is what we see in a hymn of the Rigveda where the Pramanthâ evidently represents the male, and in which the dimensions of the *Arani* and of its various parts are accurately given and the exact spot indicated on which the *pramanthâ* should be placed in order to obtain the desired result.'

The legend of which we have just spoken recurs in the *Zend-Avesta*, or sacred book of the Persians, and in the Vedic hymns of Hindustan, under its double form at once material and metaphysical. But the authors of these hymns bear witness that this same legend had long before their time been symbolised in a great national worship, whose founder, *Rhibu*, is none other than *Orpheus* himself. This tradition, common to the Greeks, Hindus, and Persians, carries us back to those early times when the branches

[1] It is a remarkable fact that the *Swastica* of India occurs often in these two forms, or upon the *fusaioles* or terra-cotta discs found in such abundance by Dr. Schliemann under the ruins of ancient Troy. Hence the natural conclusion that the Trojans were of Aryan race. See Heinrich Schliemann, *Trojanische Alterthümer*, and Emile Burnouf, *La science des Religions*. The close resemblance which exists between certain ceremonies of the worship of *Agni* and certain rites of the Catholic religion may also be explained, at least to a certain extent, by their common origin. *Agni*, in the condition of *Akta* or anointed, is suggestive of Christ; *Maya*, Mary His mother; *Twastri*, Saint Joseph, the carpenter of the Bible.

of this yet undivided stock still wandered on the banks of the Oxus.

In his 'Researches on the Early History of Mankind,' Tylor gives valuable details respecting the invention of fire, and the various means employed in every age to procure it. The primitive method seems to have been, in his opinion, the friction of two pieces of dry wood one against the other; but this process improved with the lapse of time, and in proportion to the degree of ingenuity of the

FIG. 65. THE STICK AND GROOVE METHOD EMPLOYED AT TAHITI, TONGA, SAMOA, IN THE SANDWICH ISLES, NEW ZEALAND, &c. The wood used for kindling the fire, especially at Tahiti, is the *Hibiscus tiliaceus*, a light dry wood.

FIG. 66. THE FIRE DRILL USED IN AUSTRALIA, TASMANIA, KAMTSCHATKA, THIBET, HINDUSTAN, AFRICA, AMONG THE GUANCHOS OF THE CANARIES, IN MEXICO, &c.

peoples by whom it was adopted. Thus in the first place the friction was produced by means of a stick moved rapidly backwards and forwards upon a piece of soft dry wood placed upon the ground. This method is employed by the savages of Tahiti, New Zealand, the Sandwich Islands, Timor, &c. This process is named *stick* and *groove* (see fig. 65) by Tylor, as opposed to the *fire drill* which is far more generally used (figs. 66, 67, and 68.) In its simplest form the fire drill consists of a stick of which

one end is placed in a cavity hollowed in a piece of dry wood; it is turned rapidly between the two hands, which exercise upon it at the same time a powerful vertical pressure. This implement recurs not only in Australia, Sumatra, the Caroline Islands, and Kamtschatka, but even in China, Southern Africa, and the two Americas. It was used by the ancient Mexicans (fig. 67); and is still employed among the Yenadis in the south of India, the savage Veddas of Ceylon, and the Gauchos of South America (fig. 68.)

FIG. 67. ANCIENT MEXICAN KINDLING A FIRE BY MEANS OF THE FIRE DRILL. (From an ancient Mexican painting, reproduced in outline by Tylor.)

It was a further advance when the stick used to kindle the fire was made to turn upon itself by a cord or leathern thong wound round it, and of which the two ends were alternately pulled in opposite directions. This is the instrument described in the Veddas, and still employed by the Brahmins of the present day to kindle the sacred fire. For as Tylor points out, in religious ceremonies fire is very frequently obtained by antique methods in preference to the simpler means invented by modern art. Thus the sacred fire allowed to die

FIG. 68. ANOTHER KIND OF FIRE DRILL USED BY THE GAUCHOS, A HALF SAVAGE PASTORAL PEOPLE, INHABITANTS OF THE PAMPAS OF AMERICA.

out by the vestal virgins was rekindled by means of a burning glass. A similar means was employed by the ancient priests of Peru to light the fire for sacrifices. It is one of those pious customs by which men are shown that they revere the memory of their remotest ancestors.

An instrument somewhat resembling that used by the Hindu Brahmins is employed at the present day among the Esquimaux and the inhabitants of the Aleutian Isles (fig. 69.) It consists of a stick of which one end is supported by a piece of wood fixed between the teeth, and

FIG. 69. ESQUIMAUX LIGHTING A FIRE BY MEANS OF THE THONG DRILL.

the other rests in a little hollow made in another piece of dry wood; it is put in motion by means of a thong twisted twice round the upright stick, and which the two hands draw alternately to the right and to the left. Slight modifications introduced into the construction of the fire drill, and the ingenuity of different tribes, have produced various instruments destined to the same purpose. Such, for instance, are the *bow drill*, moved by means of a bow, which resembles the modern drill; and the *pump drill*, employed both for the production of fire, and for boring holes in wood, stone, or metal (figs. 70 and 71.)

Among other methods of obtaining fire, or at least sparks, we may mention in passing, the striking of two flints against each other, or of one flint against a piece of steel or iron pyrites; the shock of two pieces of bamboo, a means employed in China; the compression of air in a wooden or ivory tube, a Malay process, &c. &c.

The dried parenchyma of the touchwood tree, the frayed bark of the cedar,[1] dried leaves, charred vegetable fibre, &c., are the combustible materials usually employed for the reception of the spark obtained by percussion.

FIG. 70. THE BOW DRILL, EMPLOYED BY THE SIOUX AND CANADIAN INDIANS.

FIG. 71. THE PUMP DRILL IN USE AMONG THE IROQUOIS FROM TIME IMMEMORIAL.

Does there exist, has there ever existed, a people to whom the use of fire, or of the manner of producing it, was completely unknown? A considerable number of authors incline to this opinion. It has been said, for instance, that the inhabitants of Tasmania are acquainted with fire and make use of it, but that they are ignorant of the means of producing it. Hence it is the special

[1] The bark of the cedar ravelled and dried is, according to Paul Kane, the substance employed by the Chinooks of the river Columbia to catch the sparks produced by means of a round stick turned by both hands in a hollow made in the middle of a plank of cedar wood.

province of their wives to bear torches, burning night and day, which serve to guide the steps of the tribe through the bush. Should the torch go out, a journey sometimes of considerable length is undertaken in order to rekindle it at the fire of another tribe. Each family nearly always carries a cone of the banksia, whose slow combustion, like that of the touchwood, is calculated to fulfil the desired purpose.'

A further proof that the Australians themselves are not so ignorant of the use of fire as certain authors imagine or assert, is found in a legend relating to its origin. We borrow the account of this fable from Wilson, who, in his work upon Prehistoric Man, has devoted a most interesting chapter to the question now before us:—

'A long, long time ago, a little bandicoot, a small sharp-nosed animal, not unlike the guinea-pig, was the sole owner of a firebrand, which he cherished with the greatest jealousy. So selfish was he in the use of his prize, that he obstinately refused to share it with the other animals. So they held a general council, when it was decided that the fire must be obtained from the bandicoot either by force or strategy. The hawk and pigeon were deputed to carry out this resolution; and after vainly trying to induce the fire-owner to share its blessings with his neighbours, the pigeon, seizing as he thought an unguarded moment, made a dash to obtain the prize. The bandicoot saw that affairs had come to a crisis, and, in desperation, threw the fire towards the river, there to quench it for ever. But, fortunately for the black man, the sharp-eyed hawk was hovering near, and seeing the fire falling into the water, with a stroke of his wing he knocked the brand far over the stream into the long dry grass of the opposite bank, which immediately ignited, and the flames spread over the face of the country. The black man then felt the fire, and said it was good.'

Was prehistoric man in possession of fire? According to the Abbé Bourgeois, man was acquainted with the use of fire from the meiocene epoch. This assertion is founded upon his discovery in the sand beds near Orleans

of a stony fragment of an artificial composite intermixed with carbon, and lying among bones of the *mastodon* and *dinotherium*. It is further supported by the cracked flints found by the same savant in the neighbourhood of Thenay, not far from the shores of the lake of Beauce. These flints bear, it seems, unmistakeable traces of the action of fire, but this may have been the effect of lightning. If it were not so, where are the ashes and the cinders which would naturally accompany these flints if they had really been exposed to the action of the fire of a hearth? Where is the hearth itself? The hypothesis of the Abbé Bourgeois may be correct, but, in my opinion at least, it is anything but proved.

But if the existence of fire as early as the meiocene epoch is open to doubt, it cannot be denied that the use of this element was known to the earliest quaternary man. Numerous hearths, ashes, cinders, bones partly or entirely carbonised, fragments of rude pottery blackened by smoke, &c., have been found in caves belonging to the age of the cave bear, the reindeer, and of polished stone, and they thereby show that the inhabitants of these caverns were accustomed to cook their food, and thus to render digestion easier and more complete.

With fire prehistoric man burnt the bodies of the dead, hollowed his canoes, and preserved from a too rapid decay the stakes which formed the platform on which he built his lake dwellings. Not only did the inhabitant of the caves and lake dwellings know how to cook his food and warm his dwelling, but he was also acquainted with several methods of lighting it at night. A piece of charred resinous wood, which was probably used for this purpose, was found in Lake Fimon. In the same way that the modern Esquimaux lights his snow hut by means of lamps fed with the oil of the seal or the whale, the Danes of the kitchen middens employed a wick of moss, one end of which was buried in the stomach of a great penguin (*alca impennis*), which is laden with fat.

In the age of the lake dwellings, silex or quartz and iron pyrites were used to procure fire by striking one of

these two substances against the other; this fact is attested by discoveries made in the Swiss lakes at Meilen, Mooseedorf, Wangen, and Robenhausen of pieces of tinder from the bark of the touchwood tree. Moreover, MM. Ed. Lartet and Christy hold that the circular or quadrangular blocks of granite with a hollow in the middle, which they found in the bone caves of Périgord, were used as a means of procuring fire by making a wooden stick revolve rapidly in the central cavity after the manner of the priests of Brahma.

We are firmly convinced, we repeat once more, that fire was very early known to man, since it is almost impossible to conceive how he can have existed without it. Hence 'who can imagine the joy, the delight, the radiant exultation of that man among our unknown ancestors who first presented in triumph to the astonished eyes of the bewildered tribe the smoking staff from which he had succeeded in producing a flame?' (Albert Réville, 'Revue des Deux Mondes,' 1862.)

Fire presided at the birth of nearly every art, or quickened its progress. The working in metals, architecture, keramic art, agriculture, navigation, commerce, industry, are all carried on by means of its life-giving flame. It has played and still plays an important part in the religious ceremonies and funereal rites of all peoples, savage or civilised. But on the other hand, as though fate ordained that evil must always accompany good, fire destroys more rapidly than it creates by forging those terrible engines, those instruments of death, by whose means the flower of nations is laid low on the battle-field.

But let us forget the ills it causes, and remember only its benefits. These have been enumerated by Wilson in an eloquent page, which will serve as an apt and natural conclusion to this chapter on the history of fire:—

'The iron ore lay a dark, unsightly, and inert mass; and alongside of it, in contemporaneous strata, the fire heat of centuries, buried in forgotten eras of geological time, had been compacted into vegetable coal. And now *fire* was to accomplish its triumphs, and make the great

levels and grand river-courses of the New World the scenes of a revolution unequalled since time itself was born. Coal and iron are welded together. The new forgers of the thunderbolts toil in the roaring forges of Birmingham, Glasgow, Wolverhampton, and Woolwich. Watt, Arkwright, Brunel, Stephenson, are the Tubal-Cains and Wayland Smiths of our modern age. The Atlantic is bridged by their ocean steamers; and, where the genius of Europe's solitary believer in a Far West guided the caravels of Spain through the dread mysteries of the ocean to another world, the merchant navies of the nations speed, defiant of wind and waves, propelled by new powers that slumbered, abiding their waking time, in that tiny spark lit by the forest-Prometheus. Tended by this willing slave, mechanical skill plies unwearied its great task. The work of old centuries is outsped in single years. Everywhere, and in all shapes, the new developments of this primitive element of science startle us with their novel and exhaustless powers. Northward, southward, and far into the wilds on the western horizon of civilisation, run the new iron highways, rush the iron horses, snorting and shrieking as they hasten onward to the Pacific, and pant till, with the ocean steamships of commerce, they shall engirdle the world.'

II. FOOD AND COOKING.

Exposed to the hardships of an inclement climate, especially at the epoch of the great extension of the glaciers which at one time covered all our mountains, a prey to all the privations of a rude and precarious life, forced to defend himself against wild beasts, often of gigantic size, which surrounded him on all sides, the first preoccupation of quaternary man was to provide himself with food and clothing by means of fishing and hunting, and to manufacture weapons and tools to assure his existence, and that of his family.

Frugivorous by instinct,[1] that is by reason of the con-

[1] Such is the opinion held by Flourens, Schaaffhausen, and Milne-Edwards, and it is also our own.

formation of his digestive organs and his dental system, in which respect he is nearly allied to the apes, which are nearly all fruit-eating animals in their natural state,[1] man soon became omnivorous from necessity, and his stomach readily adapted itself to every kind of food. Now, however, our delicacy revolts at the idea that the Australians think nothing more delicious than to gorge themselves with huge morsels of putrefying whale's flesh. We can hardly believe, and yet it is true, that the Esquimaux drink the oil of the seal and the cachalot, that the Chinese take pleasure in eating dogs, cats, rats, toads, the larvæ and chrysalides of silkworms, &c. Lastly, we are ready to rise in revolt when philanthropists, exempt from prejudice, propose to establish in our large towns slaughter-houses where horseflesh should be sold cheap, to the great advantage of public alimentation.

The Gauls and Franks were certainly more reasonable and less dainty than we are in this respect. Without going back so far into the past, we are told that not only the flesh of the horse but even that of the beaver appeared in the tenth and the beginning of the eleventh centuries on the table of the monks of Saint Gall. It is not surprising that the flesh of the noblest of mammalia was used as food by the men of Aurignac and Solutré, to mention only two examples among many. The flesh of the bear, the mammoth, and the rhinoceros figure also with honour in the bill of fare of our earliest ancestors.

The urus, the aurochs, *bos primigenius*, *cervus megaceros*, the reindeer, and at a later period the wild goat, the sheep, the wild boar, and the pig served them as daily food. They did not disdain to eat the flesh of the dog, nor even of the fox, in spite of its disgusting smell. On the other hand, like the followers of Zoroaster, the ancient Scandinavians, the Britons of Cæsar, the Jews, Russians,

[1] Savage tells us the chimpanzees reared in captivity refuse meat at first, but soon take to it. I myself saw in a travelling menagerie a macaco which had become almost exclusively carnivorous. However, there is nothing more astonishing in this fact than that captive eagles will eat bread, pigeons meat, rabbits coagulated blood, and that Icelandic cows feed upon dried salt fish.

and Lapps, actuated probably by motives of superstition, abstained from the flesh of hare. Such at least is the opinion of M. Ed. Lartet.[1]

We now know with certainty that marrow was at this same epoch a much prized dainty, as it is at the present day among the Esquimaux, the Greenlanders, and the Lapps. In this fact lies the explanation of the fragmentary condition of the bones of animals and even of the human species, which occur in the bone caves, the tumuli, the kitchen middens, &c. &c. Various species of aquatic and land birds; in Denmark the blackcock, which has long been extinct in that country; the wild swan, the great penguin, now restricted to Greenland, fish (herrings, dabs, &c.), several molluscs, especially oysters in abundance, mussels, queens, whelks, and snails, were also considerable items in the diet of quaternary man. Lastly, the milk of the flocks, and cheese were added, especially among the inhabitants of the lake cities, to the diet obtained from the animal and vegetable kingdoms.

At first the flesh of animals was eaten raw, but once possessed of fire man could cook his food and thus render it easier of digestion, and even make use of a number of animal and vegetable substances unsuited for food unless cooked. Besides, everywhere and at a very early date primitive man was forced to obey the laws of custom and of climate, and to content himself with such nourishment as nature provided for him; thus we know of lotos-eating, fish-eating, earth-eating tribes. Often even he was obliged to destroy his fellow-men and feed upon their quivering flesh, a custom which still prevails among the aborigines of New Zealand, Australia, &c.

[1] In one of the caves of Thayngen, that of Kesserloch, near Schaffhausen, besides a quantity of the bones of the reindeer and of other animals, a number of those of the hare were found (*Lepus timidus*, Linnæus). Now the bones of this animal are so rare in the ossiferous caves explored by M. Ed. Lartet, that the eminent palæontologist had been led to believe that the early inhabitants of Europe abstained, either out of superstition or from an invincible repugnance, from eating the flesh of this rodent. The discovery made in the cave of Kesserloch throws a doubt upon this theory.

The dwellers in caves, the Danes of the kitchen middens, and even the inhabitants of the earliest lake cities of the age of the mammoth and the cave bear, were not acquainted with any of the cereals nor with the mode of cultivating them.

But Robenhausen and Wangen have furnished not only the cereals of which a list has been already given, but also a number of specimens of the bread which was made from them. This bread, which was baked between two red-hot stones, is found in the form of little circular cakes, four or five inches in diameter by an inch or an inch and a quarter thick. A whole cake made from the seeds of the garden poppy, reduced to a cinder, has also been found. The bread of the lake cities was unleavened, and often contains grains entire or hardly bruised by the handmill in which they were ground or rather crushed, exactly as in the days of Odysseus, king of Ithaca, when unhappy female slaves crushed the wheat destined for the food of the chaste Penelope and her fifty suitors. A complete handmill of the neolithic age was shown at the Paris Exhibition of 1867. We reproduce here a specimen from the same period (fig. 72) as rudimentary as possible. It is in the form of a trough, and still contains the cylindrical pestle destined to crush the grain. Lastly, M. Devals discovered some acorns mixed with chestnuts in the dwellings of the troglodytes of Noulet, near Montauban.

M. Ed. Dupont had suggested that some small tribes among the primitive populations of Belgium lived exclusively upon moles and shrewmice, or at least that these animals formed their principal diet. But M. Steenstrup has proved that the immense quantity of the bones of these rodents found in certain caves of Belgium are the remains of the food of nocturnal birds of prey, notably of the barn owl (*Strix flammea*).[1]

Lund was the first to observe similar phenomena in

[1] See in the *Videnskabelige Meddelelser fra den naturh. Forening i Kjöbenhavn*, 1872, Steenstrup's paper, entitled, 'On the marks upon the bones contained in the pellets rejected by birds of prey, and on the importance of these marks to geology and archæology.'

several Brazilian caves, and he had also attributed them to their true cause, that is, the residue of their food thrown up in the form of pellets by birds of prey.

It is probable, not to say certain, that the use of sea salt as a seasoning was very early known amongst primitive races. This custom is moreover founded upon a law of nature so imperious, that even animals, at least domestic cattle, cannot be completely deprived of it with impunity. The use of salt, on the other hand, favours their growth, renders the secretion of milk more copious, the milk itself

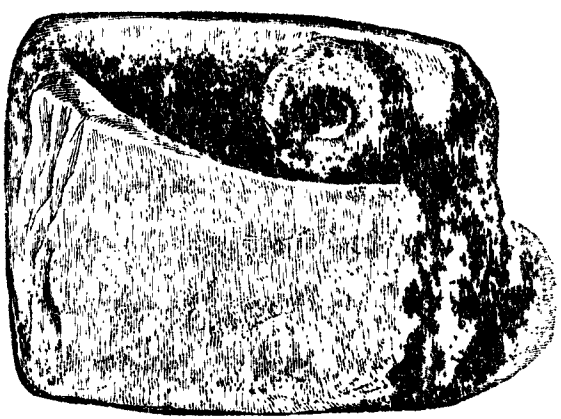


FIG. 72. NEOLITHIC MILL, IN THE FORM OF A TROUGH, FOUND WITH ITS PESTLE AT TY-MAWR (HOLYHEAD). (After Sir John Evans.)

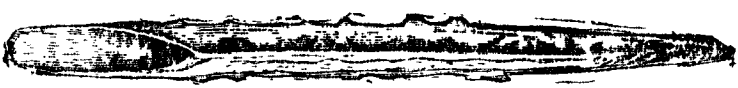
more nourishing, the flesh better and easier of digestion, and the wool of the sheep finer and more fleecy. Sea salt appears to be also necessary to man. In countries where it is rare, it is used instead of coin as a medium of exchange. Among the Gallas and the savages of the Gold Coast, Liebig asserts that one and even two slaves were given in exchange for a handful of salt.

Primitive man was thus enabled to obtain this seasoning by barter, as he obtained Mediterranean and ocean shells for the adornment of his headdress, his person, or his clothing. It appears that the ancient inhabitants of

Denmark procured this substance by burning the *Zostera marina*, which abounds upon the coasts of the Baltic, and sprinkling sea water upon the ashes.

MM. Lartet and Christy found in the caves of Périgord a kind of spatula or spoon, made of reindeer horn, with a conical handle elegantly carved, and widened and hollowed at the other end for the purpose of extracting the marrow from bones (fig. 73). There is but a step from this instrument to the use of spoons properly so called. As far as I know, however, none of the latter have ever been discovered in the bone caves of the stone ages.[1]

We have already said that frequently meat and other aliments were eaten without having been previously cooked, but often also they were roasted upon red-hot coals. The numerous hearths found in the caves and the half-charred



IG. 73. MARROW SPOON OF THE CAVES OF PÉRIGORD. (After Ed. Lartet and Christy.)

bones bear witness to the fact. But it is an open question whether or no mankind during the ages previous to the invention of pottery knew how to obtain boiling water for culinary purposes.

Before coming into contact with Europeans the inhabitants of Tahiti had no conception of boiling water, or of water in the condition of steam. If we may rely upon the accounts of the most trustworthy travellers, among others, Cook and Kotzebue, who all attest that the means used by us for obtaining boiling water are now or were

[1] The inhabitants of the island of Timor make spoons out of fragments of the shell of a species of nautilus (the *nautilus pompilius* of Linnæus). I have in my possession one of these spoons brought from New Caledonia, and which is simply a division of the polythalamous shell of this animal. I have also in my collection a valve of the *mytilus margaritiferus*, perforated near the hinge to allow of the passage of a string made from vegetable fibre. The New Caledonians are said to carry this shell suspended from the girdle, and to use it as a plate.

until lately unknown to a number of tribes in all parts of the globe, we have good grounds for returning a negative answer to the above question. Moreover, the complete absence of earthenware vessels throughout the earlier stone period seems to confirm this opinion. It is averred, however, that many savage tribes, and even some in a fairly advanced state of civilisation, procured boiling water by dropping red-hot stones into water contained in vessels of potstone, wood, bark, or leather.

The flints blackened by the action of fire found beside the hearths in the bone caves have perhaps served this purpose. Everything tends to show that this custom was commonly practised before the invention of clay pottery. The art of boiling water in earthenware vessels exposed directly to the action of fire is a real advance on the employment of red-hot stones for this purpose.[1] The discovery of pottery necessarily put an end to this most inconvenient process.

Before the discovery of the use of metals, knives were

[1] The process known as 'stone-boiling,' which consists in obtaining boiling water by means of stones heated directly in the fire and then dropped in the water, is still in use in our own day among a few tribes which Tylor describes in his interesting chapter, entitled 'Fire, Cooking, and Vessels.' See *Researches into the Early History of Mankind*, 3rd edition, p. 263. We will mention on his authority:—

1. North American tribe, the Assiniboines, 'stone boilers' who merely dig a hole in the ground, take a piece of the animal's raw hide, and press it down with their hands close to the sides of the hole, which thus becomes a sort of pot or basin. This they fill with water, and they make a number of stones red hot in a fire close by. The meat is put into the water, and the stones dropped in till the meat is boiled.

2. The Snake Indians, those of the tribe of Slaves, Dog-ribs, &c., still make, or lately made, their pots of roots plaited or rather twined so closely that they will hold water, boiling their food in them with hot stones.

3. The Ostyaks of Siberia employ for the same purpose vessels of bark sewn together, and the practice has been observed of using the paunch of the slaughtered beast as a vessel for cooking the blood over the fire, which recalls a similar method used by the ancient Scyths when other more convenient vessels failed them. The Esquimaux, the Kamtschatkans, the Australians, the New Zealanders, several Polynesian tribes, and, in Europe, the Irish of the seventeenth century, and even the modern Finns, may also be ranked among the 'stone boilers,' that is among those tribes which are in the habit of boiling their water by means of red-hot stones.

merely splinters of flint, of which a remarkable specimen was shown in the Paris Exhibition of 1867, the knife of Pauilhac (Gers), about a foot long by three inches wide.

As regards the mode of eating, the incisors of the primitive inhabitants of Switzerland, Aquitaine, Belgium, and Denmark prove that these people chewed their food in a manner completely different to ours. Their incisors, instead of being shaped like a chisel, present a flat surface like the molars. The explanation of this peculiarity is perhaps to be found in the fact that roots and coarse bread formed the staple diet of primitive man in the neolithic age.

In the action of mastication the two jaws were placed one above the other in such a way that the incisors of the upper and lower jaws corresponded exactly and did not cross. It appears that the ancient Egyptians ate in this manner, as the modern Esquimaux and the Greenlanders still do.

The primitive European races shared an advantage still possessed by savage American tribes in that their teeth were sometimes worn away even to the root without decaying. At least this has been observed to be the case in a great number of human jawbones discovered in the caves of France and Belgium. However, there are many exceptions to this rule.

We must devote a few lines to the subject of fermented drinks. The dogwood berries found in the lake of Fimon, near Varèse, by M. Lioy led this naturalist to believe that this fruit may have been employed in the manufacture of some fermented liquor. M. Gabriel de Mortillet supposes that raspberries and blackberries may have served the same purpose. If it is true that grapes have been discovered in the terremares of Parmesan, the vine, and consequently wine, were known to us at a far earlier date than the time of the patriarch Noah. The fruit of the blackthorn may have been used to make a kind of sour wine similar to that still drunk in Lorraine. We know that the taste of man for fermented liquors dates from the remotest ages.

The divine drink of the Hindus, called *soma*, was ob-

tained by extracting the sap of the *Sarcostemma viminale*, or the *Asclepias acida*. The Greeks had their *ambrosia*, the Scandinavians their *adhrœir*, the Celtiberians their *hydromel*, the Germans their *cervoise* (the beer of modern times). Lastly, the nomadic Tartar tribes drink the *koumis*, an intoxicating liquor extracted from mare's milk. The Indian tribes of South America have the *chicha*, a species of beer made from maize. The inhabitants of the isles of Tonga, or of the Friendly Isles, delight in the *kava*, the sap of a kind of pepper (*Piper methysticum*), mixed with the saliva of those who prepare it. And we ourselves, the most civilised of nations, we burn our stomachs by introducing into them those liquors which at once inflame and stupefy our brains, and which bear the names of *absinthe* and brandy, more aptly termed by the peasants of Languedoc, *aïgue arden*, or burning water, and by the Red Indians, *firewater*.

III. CLOTHING.

In hot countries the need of clothing yields to the desire of ornament: in cold climates, on the other hand, this need is real and imperious. Certain modern savage tribes go completely naked; the chiefs alone wear a scrap of matting, or a belt coloured with bright and varied hues. Others, such as the inhabitants of the Marquesas Isles, content themselves with tattooing the body; others again, the Andaman islanders, cover themselves with a coating of mud; others, like the Hottentots, make belts and boots out of the uncleaned intestines of the ox and the sheep. The Lapps, the Samoyeds, and the Esquimaux of to-day are wrapped in thick furs. This must have been the dress of the early inhabitants of Europe during the glacial period. The dwellers in caves, and even the inhabitants of the lake cities, used the skins of wild beasts, or the wool of sheep and goats, as a protection from cold, for the builders of the lake dwellings especially had certainly learnt the art of domesticating these animals.

The skins were fastened by pins or by buttons of baked

clay or bone, and sewn, at least in the reindeer age, by needles, whose workmanship is truly marvellous when we remember that they were manufactured solely with flint knives and drills. Tendons split into filaments more or less fine, or thread made from the fibres of flax or from the bark of trees, were employed in sewing. Fragments of coarse tissues found at Wangen and Robenhausen probably formed part of some garment.

Among the articles found in the above-mentioned places was a piece of leather perfectly preserved, which proves that the primitive inhabitants of Eastern Switzerland were acquainted with the first principles of tanning. But their mode of preparing the skins, and the ingredients they used in tanning, are unknown to us, nor are we likely at present to be better informed on the subject.

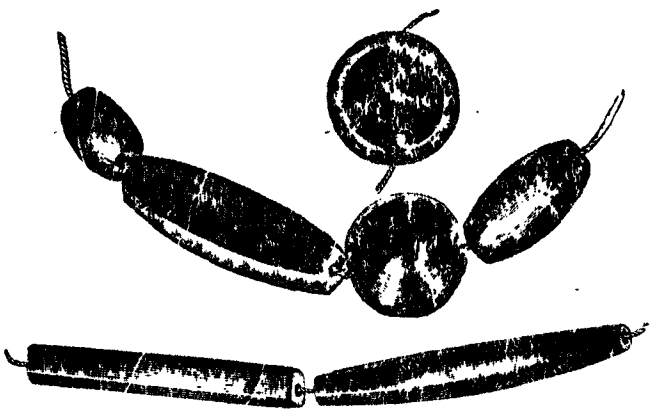
We are bound to say, in praise of the good sense of our ancestresses of the caves and lake dwellings, that nowhere has any trace been found of the stays adopted by the civilised woman of modern times, which interfere with and prevent the free play of the most important organs in the body; and of which the young Roman girls already endeavoured to justify the use by the end they desired to attain, that is, the slender grace of reeds.

IV. ORNAMENTS AND JEWELS.

Théophile Gautier says somewhere: 'The ideal torments even the rudest natures. The savage who tattoos his body, or plasters it with red or blue paint, who passes a fishbone through his nostrils, is acting in obedience to a confused sense of beauty. He seeks something beyond what actually is; guided by an obscure notion of art, he endeavours to perfect his type. The taste for ornament distinguishes man from the brute more clearly than any other peculiarity; no dog ever thought of putting rings into his ears, while the stupid Papuans, who eat clay and earthworms, manufacture these ornaments from shells and coloured berries.' From the stone age onwards, and more especially from the age of polished stone, the list of ornaments is almost complete, so natural to man is the

taste for adornment, still more so perhaps to woman, to whom coquetry often lends a further charm. But to be just, it must be owned that many men are women in this respect, as our modern dandies sufficiently show; also the ornaments of feathers, coral, shells, glass, stone, wood, and bone worn by savage tribes, and even by self-styled civilised nations.

In the caves, the dolmens, and the tumuli, and in the lake dwellings of the ante-metallic period, we find neck-



FIGS. 74, 75. JET BEADS FOUND IN TWO YORKSHIRE BARROWS. (After Evans.)

laces made from the teeth of the dog, the wolf, the chamois, the reindeer, and even of the ox and the horse. Others made of discs of the shell of the queen (*Cardium edule*),[1] of various kinds of sea shells (*natica*, *cyprœa*, *littorina*, &c.), some of which belong to species still living at the time when they were perforated for the passage of the cord on which they were strung. Others, such as those found

[1] It is a fact worthy of note that the practice of making necklaces of discs of the cardium was continued without interruption from the palæolithic age down to the age of bronze, and perhaps even later. In our day the savage tribes of New Caledonia make themselves bracelets with perforated discs, arranged in several rows, taken from the thick shell of various salt-water molluscs.

in Périgord, had long been more or less fossilised, but were still very solid, and had been carried from the shell deposits of Touraine to the districts where they now lie (*Cyprœa pyrum, pectunculus; glycimeris, arca*). But the finest necklaces are made of jet alone, or of jet and ivory (figs. 74 and 75).

Lastly, the *Coscinospora globularis*, cut into discs in every respect similar to those found in the ruins of Khorsabad in Nineveh, entered also into the manufacture of necklaces. The *terebratulæ* and the ammonites of the secondary beds have been also used as ornaments. Amber, jet, *callaïs*,[1] flint, slate, marble, hardened clay, bone, wood, &c., were adopted to make pendants both before and after the discovery of bronze. Bracelets, rings, bangles,[2] and buttons, of varied and graceful forms and different materials, pins and hair pins almost exactly similar to those now used, pendants of elegant shapes, and lastly, combs made of yew-wood, complete the list of ornaments. It is extremely probable, if not certain, that flint arrow heads of very delicate workmanship, which MM. Cazalis and Cartailhac dug out of the dolmens of the departments of Gard and Aveyron, were only used as amulets or ornaments.

As to the shells of living or fossil species, they were employed not only in the manufacture of necklaces, bracelets, and rings, but also to adorn bands for the head, or even the clothes themselves, as we saw was the case among the cave-dwellers of Mentone and Laugerie Basse.

If space allowed us to speak of the various ornaments in use in Europe during the ages of bronze and iron, we should find that they offer the most varied forms, the most graceful types, and possess the most perfect finish and delicacy. At the last Prehistoric Congress held at Bologna we were filled with surprise and admiration by the rich collection of the Chevalier Aria. Modern art

[1] A kind of light green turquoise found occasionally in the dolmens of Morbihan, and even in those of Provence.

[2] Modern art has been inspired from some of these models, as a glance at the windows of the jewellers of to-day will sufficiently show.

would doubtless find in it more than one model worthy of imitation: as also among the ornaments excavated from the lakes of Switzerland, Italy, Savoy, and even from those of Gamboge.[1]

[1] In a recently published paper, '*L'âge de la pierre polie et du bronze au Cambodge*,' Dr. Noulet has represented among the stone ornaments, large rings with wide flat edges which were used as bracelets. These rings both in shape and measurements, resemble those described by Dr. Marchant which were found in sinking a well near Dijon. The same remark applies to several smaller rings used as bracelets or ear-rings by the primitive inhabitants of Gamboge. Still smaller rings were often used with sea shells to make ornaments for the ears, belts, and necklaces.

CHAPTER II.

INDUSTRY.

I. METHODS EMPLOYED IN THE MANUFACTURE OF STONE IMPLEMENTS.

THE instincts common to all humanity necessarily produce a similarity of results when men are subjected to the same needs and placed in the same circumstances. We must therefore have recourse to the methods actually employed by modern savages in the production of their tools, in order to form a correct idea of the manner in which primitive man was accustomed to carve flints or other stones.[1] We give the account of the process employed by the Red Indians of California in the manufacture of their stone arrow heads as observed by an eye-witness, M. Cabot, and quoted by Sir Charles Lyell.

Seated on the ground and holding a stone anvil on his knees, the workman begins by breaking in two a pebble obsidian by a blow with his agate chisel. Then with a second blow he detaches from one of the halves a fragment about an inch in thickness. Holding this splinter on the anvil between the thumb and first finger of the left hand, he strikes a series of blows, each of which breaks off smaller and smaller fragments until the weapon is reduced to the

[1] Although flint in its natural condition is extremely hard, it sometimes, if it lies long enough in a permeable soil, undergoes so great a change as to permit of its being cut with a steel knife. This change in the hardness of certain flints is due, according to M. Müller, of Poictiers, to their chemical composition. They contain two kinds of silica, one white and insoluble by water, the other transparent like horn, and easily dissolved. This latter naturally disappears in consequence of the infiltration of water, and the white silica persists in a much divided state, and the molecules which enter into its composition are separated with ease.—Evans.

desired form. Such is the skill of the workman that about an hour is sufficient for the manufacture of an obsidian arrow-head.

According to Captain Belcher, the modern Esquimaux employ a process different to that described above, but which leads to the same result. It seems that strong and well-directed pressure applied to the stone is sufficient to detach splinters from it and give it the desired shape. It appears from the account of the historian Torquemada, that the ancient Aztecs employed a similar process. Sir John Evans tells us that the Mexican Indians, in order to make their obsidian razors, which are nearly as sharp as our steel ones, fix a piece of the above-mentioned rock between their feet, and press it forcibly by means of a hard wooden stake applied against the chest, and thus break from it fragments suited to their purpose.

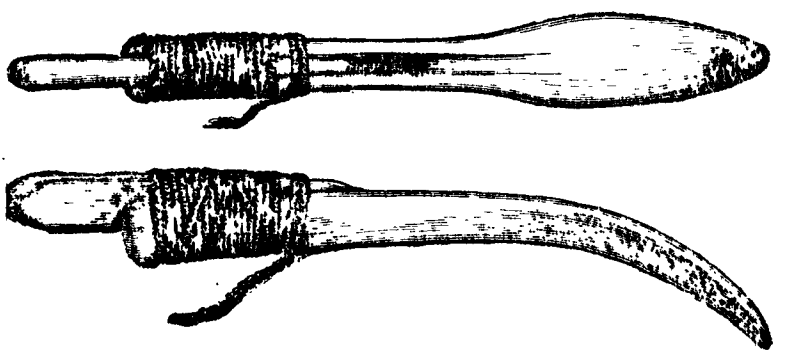
On the other hand, M. Courtes, member of the French Scientific Commission of Mexico, and M. Chabot, maintain that the Aztecs, in making their obsidian razors, begin by shaping the rock near the quarry whence it was taken. Then after having given to it the form of a prism terminated at one extremity by a blunt point, at the other a flat surface, the workman takes this prism in the left hand, and pressing it against some resisting surface, strikes it at first with light blows, gradually increasing them in force until at last he obtains splinters as sharp as razors, and destined to serve the same purpose.

For the rest, there is nothing to show that both methods, pressure and percussion, were not employed by the Aztecs, and even by the European workmen of the earliest stone age. Everything, however, leads us to believe that it was principally by means of the hammer that the artificers of Abbeville, Périgord, and other places fashioned their rude instruments. It is certain that by striking a nucleus of flint with a pebble, splinters similar to those found in the diluvium may be obtained with a little skill. Moreover, by means of a piece of elk's horn, or of hard wood fastened to a stick, Sir John Evans has

succeeded in carving these splinters, just as the North American Indians shape their flint arrow heads.

The instrument employed at the present day by the Esquimaux in the manufacture of flint weapons has received the name of *arrow-flaker*. It consists of a piece of reindeer horn, dovetailed into a handle of wood or fossil ivory, and kept in place by means of leathern thongs or plaited tendons (figs. 76 and 77), still fresh when they are bound on, that as they shrink in process of drying the fastening may be rendered the more secure.[1]

I quote this description, although I must confess to being unable to form from it a very clear idea of the



FIGS. 76, 77. ESQUIMAUX ARROW-FLAKER (HALF NATURAL SIZE), IN THE COLLECTION OF MR. CHRISTY. Back and front views. (After Evans.)

exact manner in which the Esquimaux workman arrived at the desired result. I might say the same of most of the accounts given by travellers who have made a longer or shorter stay among the half-civilised or savage tribes

[1] The bench on which the arrow heads are made is said to consist of a log of wood, in which a spoon-shaped cavity is cut; over this the flake of chert is placed, and then, by pressing the 'arrow-flaker' gently along the margin vertically, first on one side and then on the other, as one would set a saw, alternate fragments are splintered off, until the object thus properly outlined presents the spear or arrow head form, with two cutting serrated sides.—Evans, *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain*, p. 35, 1872.

whose manners and customs they describe. Hence a want of precision in our ideas; hence that uncertainty to which Sir John Evans himself honestly owns, although he has made a special study of the subject which now occupies our attention. If in spite of personal experience he is still in doubt as to many of the processes employed by tribes who are still in an almost savage condition, how much greater is the difficulty both to him and to us when we endeavour to form an accurate idea of the manner in which primitive man carved, sawed, and perforated flints or any other hard stone.

How, for instance, did the ancient inhabitants of Denmark obtain the beautiful and delicately-worked daggers which excite the admiration of those who have had the good fortune to see them in the rich museum of Copenhagen? How did the workmen of these primitive ages detach from the flint nucleus, solely with the aid of a stone hammer, the long knives of Pauilhac, or the daggers of the cave of Duruthy? Above all, how were they enabled to perforate, unaided by iron or bronze, the stone axes and hammers of which the hole for the handle is a hitherto almost unexplained enigma. We shall endeavour to give the clue presently.

As to the polish, it is easy to understand and by no means difficult of execution. A slab or fixed grindstone of more or less close-grained sandstone, water, and coarse sand, were all that was needed for this operation. These polishing stones always present grooves or circular hollows in which could be polished the convex surface of axes or gouges, and sometimes also rounded protuberances, which were doubtless used for the concave surface of the latter.

The flint saw, whose action was quickened and rendered more energetic by some mechanical process hitherto little known to us, detached pieces of rock used for the manufacture of hammers or axes. Sand moistened with water was often used to render the operation more rapid. But the comparatively small size and fragility of the saws which have come down to us, render it difficult to under-

stand their real efficacy. We pass on to consider the boring of flint and bone.

The holes destined to receive the handle of the stone hammers and axes, those perforated in the ivory discs, in wands of office made of reindeer horn, in bone needles, in teeth and shells for necklaces, and even in the skulls of the dead and living subject, naturally excite enquiry into the means employed by man to pierce them when he was still unprovided with any implements but those of flint.

This problem has been more than once propounded, but has not hitherto been satisfactorily resolved, as I propose to show by the following details.

The perforation of the eyes in bone needles presents no serious difficulty, Mons. Ed. Lartet succeeding in piercing with a flint drill, found in one of the caves of Périgord, a hole exactly resembling those of the bone needles of the reindeer age. By the same process, rendered easier by the addition of a little water, Sir John Evans obtained round and regular holes in stag's horn and wood.

By boring alternately the two opposite surfaces of an axe of hard stone, such as diorite, jade, serpentine, with a drill to which a turn of the wrist imparts a circular movement, two conical holes may be obtained of which the apices meet. This form frequently occurs upon the polished axes, but two cylindrical plugs, still adhering to the bottom of the hole and surrounded by a circular groove, are not uncommonly observed on the axes of which the perforation remains unfinished. It is difficult to explain the presence of these plugs without supposing the use of a metal point or tube moved round them in a circle. In this case the axes in question were necessarily pierced during the age of bronze, and do not enter into the scope of this work. They would, however, belong to the list of instruments of the neolithic age, if, as Dr. Keller and Sir John Evans maintain and have proved, the same result is obtainable by giving a circular motion to a fragment of cow's horn or a piece of elder

wood, and sprinkling at intervals the stone which it is desired to perforate with fine sand and water.

However, Sir John Evans owns that in his experiments with the stick of elder wood he has seen the sand accumulate in the hollow of the stem and scratch the summit of the central plug. We cannot therefore be said to have yet arrived at a completely satisfactory explanation of the central plug or nut often found upon those polished axes of which the boring has never been completed.

A fact which surprises even the most superficial observer is the almost perfect resemblance presented by the various types of stone weapons and tools, whatever be the locality in which they occur, and to whatever period of the stone age they belong. Moreover, these weapons and tools, of such widely different epochs and districts, offer the closest analogies with those of certain modern nations, such as the Esquimaux, the Australians, the New Zealanders, the New Caledonians, &c., which still remain in a savage condition not far removed from that of our ancestors. This is an evident proof that, impelled by the same needs, guided by the same instincts, surrounded by the same circumstances, man acts in the same manner in all times and in every place, and employs very similar methods.

A glance, however cursory, at the products of the industry of the stone age, is sufficient to discover a marked progress from the beginning of this period to its termination. In the earliest periods flints and other hard rocks were exclusively employed in the manufacture of weapons of war, hunting implements, and tools; the axes were never pierced for the introduction of a handle. During the reindeer age the various articles show more care in the workmanship, but the axes still remain unperforated; bone especially is skilfully wrought, and bears the marks of a further progress. The arts of design are born, and from the very first betray a firmness of hand which excites our wonder and even our admiration. With the neolithic period polish begins; the work in stone and wood becomes ever more perfect. The hole which is still rare in the axes of this epoch occurs frequently in those of the age of bronze,

whose graceful shapes resemble those of iron axes, to which they long served as models. Industrial progress is still more apparent in the iron age. Here we arrive at the threshold of history, but the nature and purpose of this work forbid us to cross it. 'However imperfect they may appear when compared with the great works of modern artists, we must not despise the first attempts of our fathers. If they had not made them, or if they had not persevered in their efforts, we should have neither our towns, nor our palaces, nor the works of art which we admire therein. He who struck one pebble against another to give it a regular form, gave the first blow of the chisel which made the Minerva and the friezes of the Parthenon.' (Boucher de Perthes.)

II. RELIGIOUS AND SUPERSTITIOUS USES OF THE FLINTS.

Styled *κεραυνία*, *ceraunicæ* or lightning stones, by Greek and Roman antiquity, and still known under similar names to various modern peoples, the carved flints are called in Picardy *langue d'çôa* or cats' tongues, on account of a real or supposed resemblance between the flints and the tongue of that animal.

In certain provinces of Italy (the Abruzzi) they are called *saette*, arrows, or *lingue di San Paolo*, tongues of St. Paul, and the peasants regard them with such veneration, that when they happen to find one they fall on their knees before it and touch it with the tongue. Some families hand down these miraculous stones from father to son as a precious legacy, and mothers hang them on their children's necks with medals of saints and madonnas, gifted with yet greater virtue than the stones from heaven.[1]

Aldrovarde gives to the flint arrow-heads the name of *glossopetra*, from their resemblance to a human tongue. Pliny believed that they fell from heaven during the eclipses of the moon, and he says that 'sorcerers believe that they are of great service to those who pay court to

[1] Cappellini, *L'età della pietra nelle valle della Vibrata.*

fair ladies.'[1] The Japanese call them sometimes *axes of the fox*, that animal being to them the symbol of the evil spirit, or else *axes of Tengu*, the guardian of heaven. Arrows of the Elfs or Erles (in Gaelic *sciat hee*) is another name for these flint weapons, recalling the labours of the Scotch elves and the German gnomes, whose king inspired Goethe with one of his best known ballads (Erlenkönig). Lastly, the *purgatory hammers* are, according to a legend still popular at the end of the last century, the very hammers used by the dead for knocking at the gates of Purgatory.

In our own day, and not only in Italy but also in the heart of our most civilised provinces, the flint axes and arrow-heads are considered as a sure protection against lightning, also against epidemics and cattle disease.

The tongues of sheep bells are made from them, and amulets which are highly prized. They are built into the walls, placed on the threshold of stables, in children's cradles, in the beds of women in travail, &c. &c. All the arguments in the world would not shake the belief of a Breton peasant, that the *moensourars*, or lightning stones, when thrown into a well, purify the water, or that boiled in the drink of diseased sheep they render the cure infallible. In Cornwall they are a sovereign remedy for rheumatism, elsewhere for ophthalmia, pain in the side, hernia, scurf of the head, &c. Ground to powder and swallowed in that form, they render the believer invulnerable, so deeply is superstition implanted in the human heart, and so hard it is to extirpate it.

And these superstitions are of the greatest antiquity. The Hebrews of the time of Moses, and probably also their remotest ancestors, are said to have employed them in the ceremony of circumcision, and often even to slaughter the animals destined for food. We know the absurd and abominable use which the priests of Cybele made on their own persons of the *religiosa silex*, sacred to the goddess. Among the Greeks and Romans, the stone arrow-heads sometimes adorned the diadems of their

[1] *Hist. Nat.* lib. xxxvii. cap. x.

gods. Jupiter himself was worshipped under the form of a stone and the name of *Jupiter Lapis*. In the Capitol he was represented holding in his hand a flint, the symbol of the lightning (*Lapis Capitolinus*). M. de Longperrier informs us that Jupiter Labrandeus and Bacchus were worshipped in the form of an axe, πέλεκυς. On the coins struck at Cyprus, the Venus of Paphos herself is represented by the figure of a stone in the form of a cone. Sacred stones, intended to be used in the sacrifices, were religiously preserved in the temple of Jupiter Feretrius, and the *feciales* carried them to strike the victims solemnly offered up to ratify the treaties concluded between the conquerors and the conquered. A similar custom is still practised, according to Klemm, on the West Coast of Africa, when the god Gimawond, splitting the clouds with a trumpet sound, deigns once a year to visit the temple consecrated to him. The ox which is offered up to him is killed with a blow from a sharp stone and not with a metal knife. Even at the time of the conquest of Mexico, that is when they were at the height of their civilisation, the priests of that country disembowelled the victim immolated to their fierce divinities with sharp fragments of obsidian.

M. Em. Cartailhac cites the account of Olaus Magnus of the custom practised by the ancient Goths at marriage ceremonies. They used to strike flint and steel together over the heads of the bride and bridegroom to symbolise the manner in which the life which lies hidden in the two sexes is manifested and multiplied by love, just as the latent fire of flint is produced by percussion.

The Catholic Church herself, at least in certain countries which are faithful to ancient customs, has recourse to flint and steel to kindle a new fire on Easter Eve. '*Ignis de lapide excutitur et cum eo accenduntur carbones*,' are the words of the liturgy.

The Japanese preserve the carved flints religiously in their temples, and regard them as the primitive weapons of the *kumis*, unbodied spirits who were the earliest inhabitants of the country.

These stones figure also in the funeral ceremonies of many nations. The Egyptians employed them to disembowel the dead previous to embalming the body. They are found in the ancient Peruvian tombs, in those of the Mississippi Valley,[1] and also in the sepulchres of Egypt and Etruria. They occur likewise in the burial caves of prehistoric ages, in the dolmens, the tumuli, and even in the tombs belonging to a more recent epoch. They are sometimes found alone, sometimes in company with metal objects, and with other offerings to the dead whose remains are enclosed in the tomb.

Lastly, the practice of opening the bodies of the chiefs with an obsidian knife prevailed among the Guanchos of the Canary Isles, as among the Egyptians.

In antiquity and in the middle ages, the formation of flint axes, knives, and arrow heads was generally attributed to thunder. Towards the middle of the seventh century an equally irrational theory was propounded. Some authors declared that the supposed *ceraunicæ* were iron instruments turned to stone by the lapse of time; but, says Boethius, 'the fable that these are lightning darts is so firmly established and accredited by so many people, that he who would gainsay this opinion would be looked upon as a madman.'[2]

Such was, and such is still, the opinion generally prevailing. Formed by lightning in the midst of the clouds, the *lapides fulminis* fall ready made upon the earth, in which they bury themselves more or less profoundly from the force of their fall—six feet say the peasants of Aveyron, sixteen ells according to those of Calabria. But every year they rise a foot or an ell towards the surface, especially when it thunders, and appear at last above ground, usually after about seven years, according to some, at the end of eighteen years, neither more nor less,

[1] M. François Lenormant found in two of the Cyclades, Milo and Santorin, and Mr. Ross in the very early tombs of Amorgos and Anaphé, some fragments of obsidian which bear the most striking resemblance to those of Mexico.

[2] Quoted by Em. Cartailhac, *L'Age de la Pierre dans les souvenirs et les superstitions populaires*, p. 11.

according to others. Then these *cuogni di truoni*, or coins of the thunder, are religiously collected and preserved as a precious talisman against lightning. If when they are suspended over the hearth by means of a blue thread, the latter does not catch fire, it is a sure proof that they possess this preservative power in an extraordinary degree.

We refer to the paper of M. Em. Cartailhac those of our readers who desire to become acquainted with the curious theories by which the learned contemporaries of Boethius of Bort sought to explain the formation of the *ceraunicæ* in the bosom of the clouds.

It was towards the end of the sixteenth century that correct theories as to the nature of the so-called thunderbolts were propounded by Mercati, who considered them to be the weapons of a primitive people to whom the use of bronze and iron was completely unknown.[1] A little later (1734) Mahudel declared himself an adherent of this belief. William Dugdale, in his 'History of Warwickshire,' and Bishop Lyttleton in his 'Observations upon the Stone Axes,' also owned to opinions similar to those of Mercati.

A few axes of polished stone, bearing Greek or Runic inscriptions, were evidently worn as amulets by warriors, who, in order to ensure their victory, hung them round their necks during the battle. Arrow heads, mounted in gold or silver, figure also as amulets in the richest necklaces of ancient Etruria. M. Cartailhac has given illustrations of some magnificent specimens in his recent work on 'The Age of Stone' (see figs. 31, 32, 33).

Finally we may remark that the numerous flints found under the circumstances and in the places we have mentioned prove that the age of stone has been universal, and nearly everywhere prehistoric. They also bear witness to that instinctive tendency which leads every people to revere the memory of its ancestors, to render some kind of worship to the articles they have employed, to attribute

[1] The Emperor Augustus had at least suspected the original use of the flint weapons, for he styles *arma herorum* the supposed ceraunicæ which he found in the bone-caves of Capri.

to them a divine origin and a number of marvellous qualities, and even sometimes to look upon them as gods.

This feeling, in itself as praiseworthy as it is natural, engenders superstition, which, according to Tylor, 'is only the continuation of old customs in the midst of a new and completely modified condition of society, the persistence of ancient religious practices long after those practices have disappeared from the ordinary acts of life.'[1]

III. WEAPONS OF WAR AND OF THE CHASE.

When we compare the arms of primitive man with the formidable engines of destruction which the demon of war has latterly invented, we are tempted to smile at the sight of these stone axes, these arrow heads of flint or bone, in appearance so little terrible; or rather we are saddened at seeing in some sort the verification of the infamous saying, '*Homo homini infensus nascitur.*' What energy, trouble, and weariness, what money, thought, and blood, does he willingly spend in destruction, who can create nothing!

The passions of hatred, ambition, and revenge were the original causes of war; hunger, perhaps even the satanic pleasure of killing, gave rise to hunting. Our first offensive or defensive weapons were the bow, the arrow, the javelin, the lance, the sling, the hunting-knife, the dagger, the club, and the battle-axe.

The bow has existed in all times and among all peoples.[2] A branch of flexible wood, a string made of tendons, vegetable fibre, or a leathern thong, are the only materials necessary to its manufacture. A fragment of hard stone sharpened to a point, a pointed bone, the bone or tooth of a fish, forms the essential part of an arrow, which is com-

[1] Tylor, *Early History of Mankind*, p. 221.

[2] At least this is the general opinion. But Evans and some other writers maintain that the use of the bow is unknown to completely savage peoples, such as the Australians and the Maoris, and that this weapon seems to belong to a fairly advanced stage of civilisation. But he adds that the use of the bow in Europe dates from an extremely remote epoch, since flint and bone arrow heads are very common from the beginning of the reindeer age. Remains of yew-bows have been found in the lake city of Clairvaux, which belongs to the neolithic age.

pleted by a shaft of wood, cane, or reed. The lance, the javelin, and the sling, the knife, the dagger, and the club, are equally simple in character; all these weapons were first manufactured from hard stone or bone.

Flint is the stone most commonly employed in the countries where it abounds; but where it is rare or completely absent man has supplied its place by similar substances suitable to his purpose. Thus the primitive inhabitants of the isle of Elba employed for the manufacture of their missile weapons, instead of flint, which is wanting in their country, common quartz, jasper, hyalin quartz, diorite, carnelian, eurite, hard chalk, and serpentine, which they found ready to hand. They borrowed from France, from Naples, and perhaps from Sardinia, the fire-bearing silica, and various kinds of chalcedonian silica, and of jasper, and even the black obsidian, which is very common in Sardinia, as M. Marmora has shown. Other tribes employed hornblende, jade, and its varieties, porphyry, black basalt, &c.

FIG. 78. DANISH SPLINTERED FLINT. (After Lubbock.)

Starting from the mere splintered fragment (fig. 78), the flint weapons have received the most varied forms. Hence, as regards the arrow heads, for instance, the numerous (perhaps too numerous) types into which they are divided by men of science. Thus they distinguish those which have the form of an almond, of a laurel or olive leaf (fig. 79); others are trian-

gular or lozenge shaped, others are more or less barbed at the base (figs. 80, 81, 82, 83). Some are furnished with a *peduncle* or *stalk*, with one or two *auricles*, *wings*, or

FIGS. 79, 80, 81. IRISH ARROW HEADS. (After Lubbock.)

barbs (figs. 80 and 81); others have only the wings without the peduncle (fig. 84). Some arrows are delicately carved, with serrated edges, and the workmanship is so

FIG. 82. PREHISTORIC FLINT ARROW HEAD. (France.)

FIG. 83. MODERN FLINT ARROW HEAD. (Tierra del Fuego.)

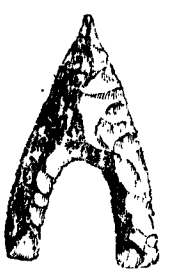


FIG. 84. ARROW HEAD, WITH WINGS AND WITHOUT PEDUNCLE.

perfect that it is difficult to understand how they were made without the aid of metal tools. These graceful arrow heads belong principally to the neolithic age, and they are found

for the most part in the dolmens and burial caves, in company with beautifully wrought lance heads and javelins.

This grace of form and finished workmanship, and the considerable time which it must have taken to make them, give rise to the supposition that they had another use than that of projectiles, which are usually destined to serve but once. Were they not rather trinkets, amulets, ornaments, anything in fact but weapons for hunting or fighting?

The dimensions of some of those found by Raffaelli

FIG. 85. AXE OF THE ST. ACHEUL TYPE, CARVED ON BOTH SIDES.

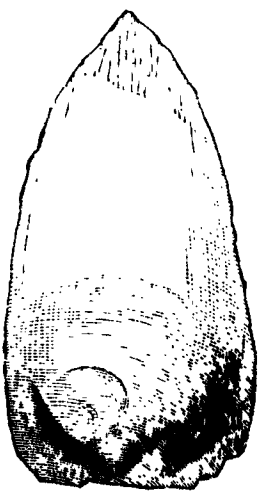


FIG. 86. LANCE HEAD OF THE MOUSTIER TYPE.

Foresi in the caves of Elba, and which were only seven lines long by four wide, confirm any doubts that may arise respecting the real use to which these tiny arrow heads were put. For the rest we know that flints cut into the form of axes and projectile weapons figure later on in popular superstitions and religious rites, and that they even adorned the diadems of kings.

Other lance and arrow heads, such as those of Solutré

(fig. 18), much larger than the preceding, are also distinguished by their elegance of form and finish of workmanship, which is the more remarkable that they succeed immediately to the comparatively coarse work in a completely different style, of which the flints of St. Acheul and Moustier have left numerous types (figs. 85 and 86).

In a few peat mosses only of Switzerland and Ireland

FIGS. 87, 88. ARROW HEAD WITH SHAFT, FOUND IN A PEAT MARSH IN SWITZERLAND. SEEN IN PROFILE AND FROM THE FRONT. (After Evans.)

FIG. 89. ARROW HEAD AND SHAFT OF SOUTH AMERICA. (After Lubbock.)

FIG. 90. ARROW WITH TRANSVERSE EDGE, FOUND WITH SHAFT. (After Evans.)

FIG. 91. ARROW HEAD, WITH BITUMEN, FROM THE LAKE CITY OF ST. AUBIN, SWITZERLAND. (After de Mortillet.)

some flint arrow heads have been found still attached to the shaft (figs. 87 and 88). Examination shows that these had been inserted by their peduncle into the stem, and were fixed there by tendons or string steeped in bitumen. As this same bitumen is also found on some arrow heads of the lake dwellings of Switzerland (fig. 91), we may conclude

that these also were fastened to the shaft after the manner adopted in the more recent epoch of the peat mosses.

FIG. 92. FLINT LANCE HEAD. (After Lubbock.)

FIG. 93. FLINT DAGGER. (After Lubbock.)

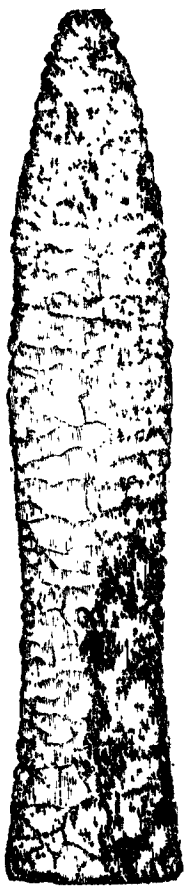


FIG. 94. FLINT DAGGER WITH BROKEN POINT.

It seems probable that the heads of the lances and javelins were attached to the shaft in the same manner,

and a glance at the methods employed by modern savages to fasten the handles of their missiles renders it almost certain (see fig. 89).

The purpose the arrows with a transverse edge were intended to serve has been disputed. Some suppose that they were employed for shooting at birds, so as to kill them with a shock, and avoid staining the plumage with their blood. But a proof that they were also used in war is furnished by the presence of one of these arrows in a

FIG. 95. WOODEN HARPOON, BARBED ON ONE SIDE. (After Broca.)

human vertebra, taken by M. de Baye from a cave belonging to the neolithic age.

We need only say a word or two about the flint daggers, which in size and shape are so similar to the lances (figs. 92, 93, 94), and to the larger knives, that they have often been confounded with them. In the reindeer age the bone daggers were very carefully wrought and ornamented with carvings, of which we shall presently give a detailed description. In the neolithic age, and even a little earlier, this weapon was still further improved. Towards

FIG. 96. BARBED BONE ARROW. (France, after Lubbock.)

the end of this period the flint carving attained a degree of finish which we could hardly equal in our day with all our metal implements. Among the most remarkable of these daggers we may mention that found by M. Louis Lartet in the cave of Sordes, which offers a striking resemblance to a fine Egyptian dagger with a wooden handle in the Haig collection of the British Museum.

The reindeer hunters made long harpoons and barbed arrows (fig. 95), in the barbs of which a little channel was

sometimes hollowed, destined it is supposed to hold the venom to poison the wound (figs. 96 and 97). It is worthy of note that the barbed arrows were only employed for killing the reindeer or other large animals; little bone arrows in the form of a pointed cone, and without barbs, sufficed for the destruction of birds and the smaller mammalia (see fig. 98). The dagger gave the death blow to the dying animal. Lastly, the hunting marker and the whistle for giving orders or for rallying the troop completed the equipment of the hunt of the stone age.

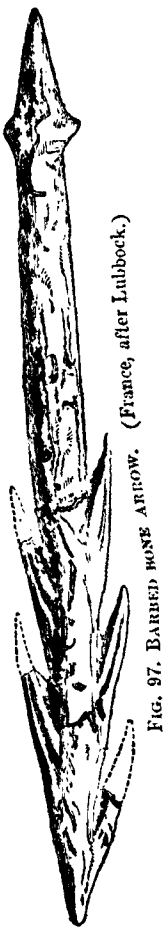


Fig. 97. Barbed bone arrow. (France, after Lubbock.)

The maces or clubs were made angular stones, dove-tailed into wood handles or bound to them by leath thongs. Clubs made entirely of wood i in a fair state of preservation have b found under water. One was found Glasgow in a primitive canoe. The br axe was made like the hatchet in ordi use, which often did duty for the for The method, or rather methods, of fa ing the head to the handle were the for both.

Great doubt still prevails as to t of some bone implements of the r age which MM. Christy and Lartet] represented in their 'Reliquiæ Aqui nicæ,' and which they style sceptres or w nds of office (figs. 99 and 100). These instruments were perhaps only trophies of the chase, like the carved horns of the *urus* among the Germ me of Cæsar. But a comparison upposed tr phies or marks of distinction with the *pac a-mogan* (fig. 101), the club of the Canadian Indians, inclines us to believe that they were weapons of the chase or of war. Like the sceptres of

Périgord, the *puck-a-mogan* or *pogamogan* of the Indians of the Mackenzie River is made of reindeer horn, from which all but the first branch has been previously removed.

Pigorini has recently suggested that the supposed wands of office are allied to the pieces of stag's horn which

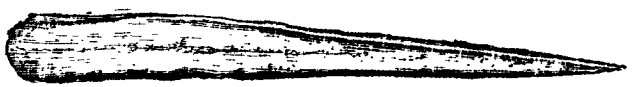


FIG. 98. UNBARBED ARROW OF REINDEER HORN. (After Broca.)

the modern Sardinians use in the manufacture of the hinges of their harness (fig. 102). But a careful perusal of his description and of the arguments he brings forward in support of his opinion, has hitherto failed to convince me. Among projectile weapons we must also reckon the stone, for slinging which were employed in the chase and in

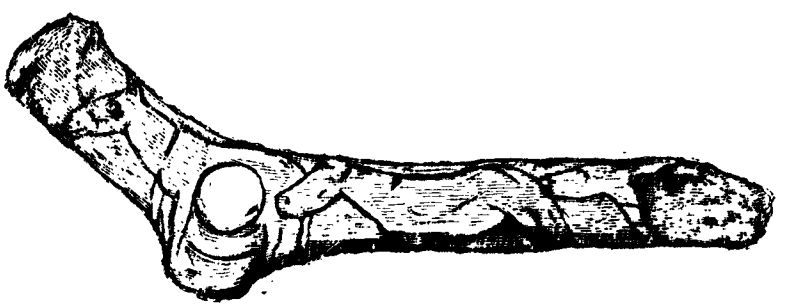


FIG. 99. WAND OF OFFICE, WITH A SINGLE HOLE. (Reduced to one-third of its size.)

war from the earliest stone period down to the beginning of the iron age. Often confounded with the sinkers of fishing nets, the sling stones were in all epochs merely pebbles more or less polished and waterworn by rivers or torrents. It is the general opinion, however, that flint pebbles rudely carved into somewhat the form of a burning glass, found in the Danish kitchen middens, in England,

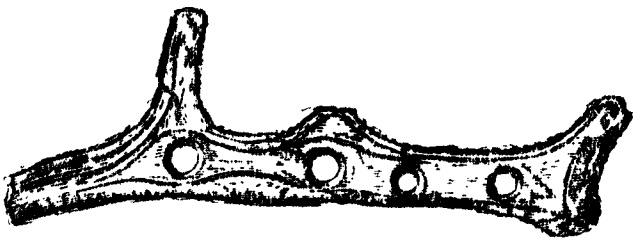


FIG. 100. WAND OF OFFICE WITH FOUR HOLES.

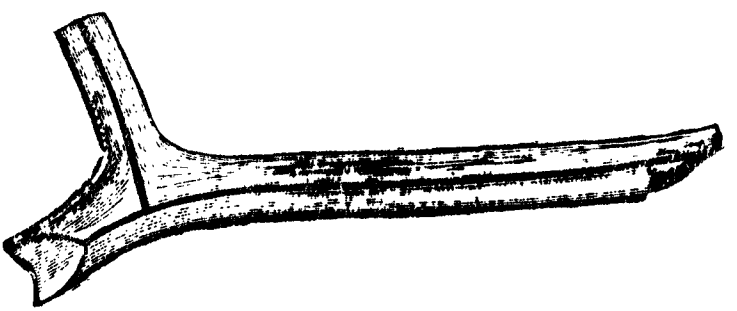


FIG. 101. THE POGAMOGAN OF THE ESQUIMAUX (reduced to one-fourth its natural size.) (After Broca.)

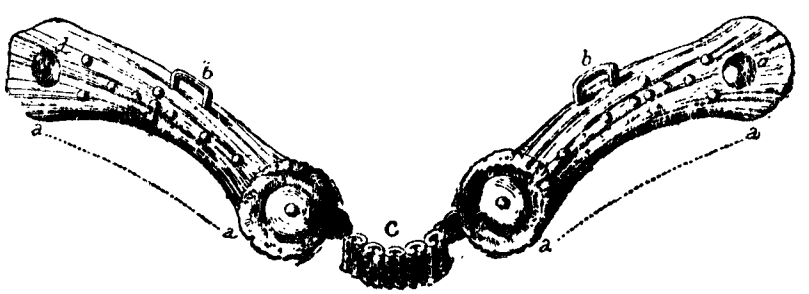


FIG. 102. SARDINIAN STAG'S HORN HINGE. (After Pigorini).

a a', Pieces of stag's horn eight inches long. *b b'*, Iron rings through which the thong passes. C, Metal chain, uniting the two pieces of horn which are placed horizontally along the sides of the horse's head. *d d'*, Holes through which the bridle is passed.

Scotland, and elsewhere, were also stones for slinging.[1] With regard to the slings themselves, they were probably made of a long and narrow leathern thong, or consisted, like those of the New Zealanders and New Caledonians, of a plaited cord made of bark fibre and wider in the middle than at the ends; or, finally, they were simply a stick split at one end, or bored with a hole for the reception of the stone, like those which children play with. Our conjectures regarding the existence of slings during the neolithic age, and perhaps in the earlier stone period, are founded upon a discovery which relates to a more recent epoch. A sling, or rather the pocket of a sling, beautifully plaited, and knitted on to the portion of the hempen cord which still remained attached to it, was found at Cortaillod, in Switzerland; and although it probably dates from the age of bronze, and perhaps even from a yet more recent period, we feel called upon to notice it here as one of the most curious discoveries which have been made in the lakes of ancient Helvetia.

Neither must we leave unmentioned the fire balls found in the Swiss lakes. These consisted of a mixture of coal and clay, which, after being made red hot in the fire, were thrown at the dwellings of the enemy. In this manner the Norrii are said to have set fire to Cæsar's camp; and it is thus that, long before his time, a number of lake cities were several times destroyed.

It is difficult to understand how, with weapons apparently so ineffectual, the still savage inhabitants of Scandinavia, Belgium, France, and Italy were enabled to hold their own against the elephant and rhinoceros, not to speak of the cave bear and lion. However, we learn from Herodotus that the Ethiopians of Xerxes' army destroyed elephants, and in modern times Bruce asserts that the Schangallas bring down the rhinoceros with weapons as slight as those of primitive tribes. Besides, these tribes

[1] In our day, however, the slinging stones are polished with the greatest care by the barbarous tribes of New Zealand, New Caledonia, &c.

probably had recourse in their adventurous chase to snares or pits covered with branches, similar to those described by Cæsar, into which they drove the hunted animals, and then despatched them with blows from a club, or by setting fire to the branches. The hunting markers and

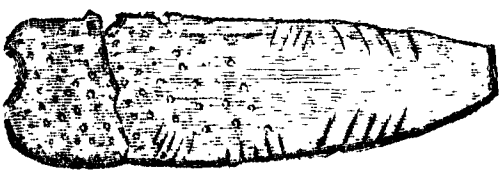


FIG. 103. HUNTING MARKER. (After Broca.)

counting sticks, of which we give illustrations (figs. 103 and 104), deserve a passing mention.

IV. FISHING IMPLEMENTS.

Primitive man was either hunter or fisher, and often both at once. As hunger and the need of means of defence had inspired him with the idea of the bow, the arrow, the lance, the axe, and the sling, so they led him to the invention of fish-hooks, harpoons, and lastly nets. For in

FIG. 104. COUNTING STICK. (After Broca.)

certain of the Swiss lake dwellings of Switzerland, notably at Wangen, on the Lake of Constance, nets made with considerable skill have been found, with clay weights to sink them in the water, and even wooden floats. In the Swiss lakes also osier baskets are frequently found, and fish-hooks and harpoons of flint, bone, or shell, are still more common; others which might have been manufactured by the modern inhabitants of the Kurile Islands

or of Greenland (fig. 105), have been discovered in various parts of Scandinavia, France, and Italy.

From the earliest times these fishing implements were admirably suited to the purpose for which they were intended—that is to say, they were furnished like those of modern times with barbs destined to retain the hook in the palate of the fish. Sven Nilssön has figured some flint sinkers, with a single or double circular groove, very finely polished. ('The Primitive Inhabitants of Scandinavia,' Plate II., figs. 31–35).

The harpoon is as useful in fishing as the hook; often even it is used in hunting birds and amphibious mammalia, to impede them at least in their flight, if the vigorous blow which buries the weapon in their flesh fails to

FIG. 105. FISH-HOOK OF THE SOUTHERN SEAS. (After Lubbock.)

strike a vital part. The bone harpoons of the troglodytes of Vézère are always furnished laterally with a single row of teeth or curved barbs, which distinguishes them from the barbed bone arrows with a double row of lateral teeth, and with which they were for a long time confounded (fig. 96). The end of a cord was fastened to the harpoon round a small protuberance made at the base for that purpose, so that the harpooner could detain it after the throw.[1]

[1] The bone harpoons of the inhabitants of the Kurile Islands closely resemble those of the troglodytes of Dordogne. The head is sometimes moveable, sometimes fixed, and they are provided with a wooden shaft in which a hole is pierced for the passage of a leathern thong or of a cord attached at one end to the shaft, at the other to the point which separates itself naturally when the animal is struck. Lastly, a bladder fastened to the free end of the cord and floating on the surface of the water indicates the direction taken by the animal in its flight.

The caves situated on the banks of the Vézère contain an immense quantity of the bones of the salmon, a clear proof that the inhabitants of the caves hooked, or rather harpooned, this fish in the river near their dwellings and in the other streams of Périgord. There is no sufficient proof that they were acquainted with the use of the net.

V. TOOLS.

Tools are the supplementary organs of man, the instruments necessary to the development of his genius, or what is nearly equivalent, his artistic and industrial instincts. For without tools man would be reduced to inaction and condemned to a perpetual infancy. With their aid he becomes capable of all things. With his teeth and nails man would try in vain to cut down a tree with the rapidity and skill of the beaver. But what animal can cut wood as easily and as cleanly as man once possessed of the saw? What animal, without excepting the woodpecker or the teredo, could drill a hole so perfectly circular as that which we can bore with the auger or the gimlet? And so man early sought to multiply his means of action, and provide his hands, his eyes, his ears, with supplementary organs invented by the workings of his intelligence. Hence arose tools and all those marvellous instruments known to-day under the names of telescopes, microscopes, telephones, phonographs, &c. &c.

Time was when man was ignorant of the art of polishing one stone by means of another. His tools were then rude and few in number; he already possessed, however, the most indispensable implements—the knife, the axe, the hammer, the chisel, the saw (fig. 33), the gouge, the scraper or grater, and the hone. The polishing stone is of far more recent date.

From the reindeer age, and even earlier, he knew how to make drills of wood and bone (figs. 106 and 107), awls for punching holes in leather, and needles and pins of bone. To this list may be added pickaxes, handles and sockets of axes, and lastly, hammers of stag's horn.

As soon as he knew how to polish his hammers and

axes, man conceived the idea of drilling a hole for the handle; but this idea was of late birth, and during the whole of the neolithic age it was seldom put in practice. On the other hand, the boring of stone became common in the age of bronze, the habitual use of the metal drill rendering the operation easier.

We will begin by describing those tools in most con-

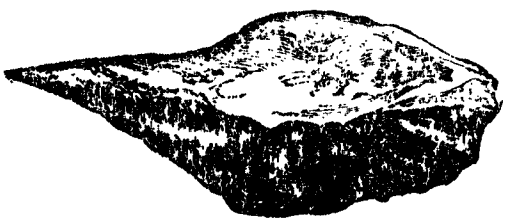


FIG. 106. STONE DRILL FROM THE DANISH KITCHEN MIDDENS. (After Lubbock.)

stant use, the *striker* and the polishing stone, the former during both the stone periods, the latter during the neolithic and following ages.

The striker was formed of a very hard stone, quartz or granite, never of gneiss or flint. As a rule, these tools are more or less circular in outline, and more or less flattened on their lateral surfaces, slightly hollowed

FIG. 107. BONE DRILL FROM SCOTLAND. (After Lubbock.)

to give a firmer hold to the fingers. Upon their blunt edge, traces of the blows to which they have been subjected may be distinctly seen. The circumference of others, sometimes perforated laterally, is grooved. Nilsson believes this channel to have been intended for the passage of a cord by which the stone was suspended from the belt, so that it might be always at hand for the hunter or

workman to put a new edge to his weapons or tools. The hole observed upon certain of these strikers, which are not grooved, probably served the same purpose. Lastly, mere hard flat pebbles, easily held between the fingers, may have been used as strikers.

All archæologists will not allow that the use which we with Nilssön have attributed to these stones is proved beyond dispute. Troyon believes that these disc-shaped stones were employed in a game similar to the *chungke* of the American Indians, which consists in setting the stones rolling and in running after them, throwing poles adorned with ribands, on one of which the stone's course is arrested. The position of the disc upon the riband determines the victory or defeat of the player. Sir John Evans on his side affirms that prehistoric peoples principally employed the hammer in the manufacture of their instruments of war, of the chase, of fishing, or of daily work. But without gainsaying the very early use of the hammer, what prevents us from admitting at the same time that of the striker, inscribed so to speak on the implement itself? Certain archæologists, however, have considered the discs in question as weaver's shuttles, as weights for fishing nets, pulleys, and even maces; various uses for which they may doubtless have been occasionally employed.

Towards the period of the formation of the great rubbish heaps on the shores of the Baltic, known as kitchen middens, the primitive inhabitants of Europe conceived the idea of polishing their weapons and tools, and of sharpening their edge by means of a stone similar to those which we now employ for grinding our metal tools (sandstone, quartz, flinty schist, &c.)

The form of these stones is usually an oblong polyhedron, narrowed towards the middle and broader at the extremities. One surface—concave, convex, or flat—is usually furrowed into grooves which indicate the wear occasioned by the continual friction of a small instrument such as the gouge or chisel. The larger polishing stones, those whose considerable weight prevented their transport, or at any rate rendered it difficult, remain in the place

they originally occupied. Such is the *notched stone* of Chauvigny, which still bears the marks of twenty-five notches or grooves clearly indicating the purpose it served. Such again is the polishing stone found at Cerilly, in the department of the Yonne, whose surface presents eleven grooves as distinctly marked as those of the notched stone. The edge of the hatchets, knives, chisels, &c., was applied to these grooves, and constant friction, produced by a continual backward and forward motion, gave to the instrument the desired graining and polish. Other polishers, smaller and easily portable, were often ornamented with scolloped edges, and perforated for suspension. These latter bear the most perfect resemblance to those employed by the Greenland women to sharpen and polish their

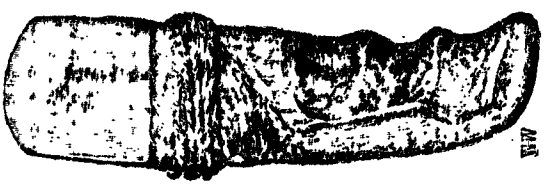


FIG. 108. ESQUIMAUX KNIFE, WITH HANDLE. (After Lubbock.)

bone needles. Others, lastly, are similar to those used in the present day for sharpening our scythes and sickles.

The knife is certainly one of the most ancient tools. We could, if necessary, enter into the fullest details respecting the form and dimensions of this implement, whose nature and use were so long misunderstood, though they figured from the earliest historic ages in the religious ceremonies of the Hebrews, the Egyptians, the Greeks, the Romans, and perhaps even of the Scandinavians.

The form of the flint knives is very various; sometimes the cutting edge was straight (fig. 108); sometimes, but much more seldom, it was curved (fig. 109). Some had a round or prismatic stone handle, a continuation of the blade itself; others were provided with a wooden handle, to which the blade was probably attached by means of a

black cement, similar to that used, as we have seen, by the savages of Scandinavia for their arrows, lances, and javelins, and to that still in use among the New Zealanders. The blade of some of these knives was no longer or wider than that of a penknife; sometimes, again, it was of considerable length, like a hunting-knife. MM. Noulet and Bischoff have described two of the latter, the one in the 'Mémoires de l'Académie des Sciences, Inscriptions, et Belles Lettres de Toulouse;' the other in the 'Revue de Gascogne,' edited by the Abbé Caneto (August 25, 1865). The blade of the first of these knives, found at Venerque, in the department of Haute-Garonne, by Professor Noulet, is imperfect; and it nevertheless measures six inches long by two wide. That of the knife of fire-bearing flint, dis-

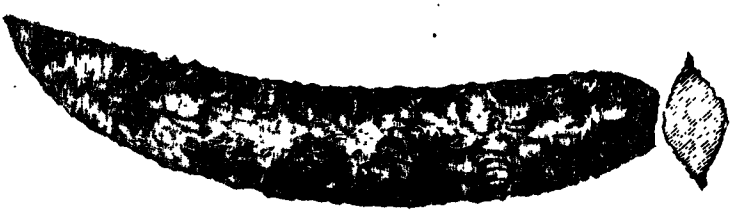


FIG. 109. CARVED PREHISTORIC STONE KNIFE.

covered at Pauilhac, in the department of Gers, by M. Bischoff, was longer still. Unfortunately it was broken into three pieces; but the fragments fit perfectly, and all three together measure fourteen inches long. The two specimens, the finest known, have the form of a much flattened triangular prism; one surface is slightly concave, the other has two oblique faces, separated by another central one which becomes gradually narrower and finally disappears as it approaches the upper or rounded extremity of the knife.

It is difficult to understand how these great pieces of flint were shaped merely by the aid of a stone striker. The thing was nevertheless possible, and we have the proof of it under our eyes. Moreover, Sir John Evans affirms and proves *ipso facto* that it is possible to carve

flint with another pebble as well as with the most solid steel hammer.

Polished or not, employed in war, in hunting, and in the ordinary uses of daily life, the axes of the stone age take various forms, of which several closely resemble our modern hatchets. The earliest in date have usually the form of a wedge or much flattened pear, with slightly convex surfaces; the edge is wide and equally sloped on

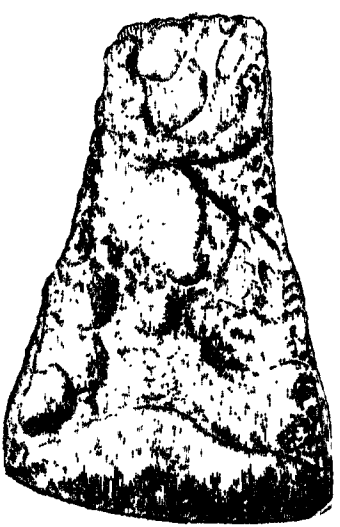


FIG. 110. NEW ZEALAND STONE AXE (After Lubbock.)

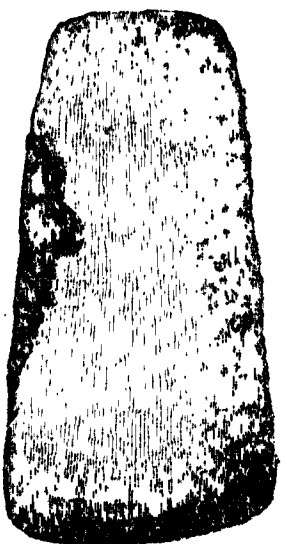


FIG. 111. POLISHED STONE AXE FROM THE SWISS LAKES.

both sides, the summit is narrower and sometimes ends in a point. Those of Saint Acheul, in the department of the Somme, present a well-known type.

The axes are very varied in size. Some of them, beautifully polished, which were found in Sweden and Denmark, are thirteen inches long by an average width of thirty-five or thirty-six inches, and a thickness of fourteen or sixteen inches. Those of France and Swit-

zerland, are generally not so large. M. Bischoff, however, has lately called attention to one of old green jade, which he found in the valley of the Gers, nearly ten inches in length. The inhabitants of New Zealand and of New Caledonia make similar axes of this jade, which is very hard, and will take so fine a polish and so sharp an edge that we were ourselves able to cut great notches with it in a log of hard oak. These wedge-shaped axes have different kinds of handles. Sometimes, like those of several modern savage tribes, they were inserted in a notch or groove made in the shorter end of a naturally-bent piece of wood, and were kept in place either by crossed thongs or by a cord wound several times round the upper part of the axe and handle. Sometimes the whole was rendered more solid by bitumen, and occasionally a single stick, pierced, forked or split, served for the handle. In his work entitled '*De l'Homme Antédiluvien et de ses Œuvres*,' M. Boucher de Perthes has represented several different kinds of handles used for the unpolished axes. Sir John Evans has also given some curious illustrations of those of the polished axes. We must say a word or two respecting the manner in which the inhabitants of our caves of the reindeer age, and those of the lake cities of Switzerland, commonly attached their axes to the handles.

After having separated a piece of reindeer or stag's horn with the flint saw, they hollowed a groove in this fragment, into which they introduced the upper end of the axe. The piece of horn which served as a socket or protecting sheath was itself fixed in a hole made in the larger end of a club-shaped piece of wood. A sort of ledge or shoulder on the under side of the socket prevented the axe from being driven back into the handle so as to split it. In other cases they contented themselves with inserting the polished axe directly in the hole of the key-shaped handle, keeping it in place by means of cords and a suitable glue (fig. 112). Another method consisted in placing the axe in a socket of stag's horn pierced transversely by a hole, into which a wooden handle

was fitted. Sometimes a stem of hazel with its root attached, and forming a right angle with the former, was chosen for the purpose. The root was split and the axe introduced into it and fixed by means of cords and bitumen (figs. 113 and 114).[1]

It is worthy of remark that these various methods of attaching the axe to the handle are still employed by the savages of New Caledonia, of the Fiji Isles, and of various parts of America.

Some of these handles, of ash, hazel, or fir wood, have been preserved. Such, for instance, is that of a hatchet

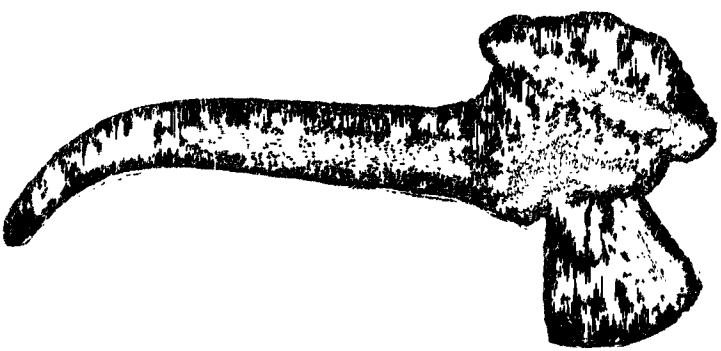


FIG. 112. AXE, WITH STAG'S-HORN HANDLE, LAKE CITY OF CONCISE. (After de Mortillet.)

found at Robenhausen, of which M. Keller has given an illustration; that of an axe found in county Monaghan, and preserved in the Museum of the Royal Academy of Ireland; the hatchet of Solway Moss, now in the British Museum, and several more. Unfortunately, these handles, as soon as they are taken out of the water of the lakes, or from the damp earth, lose their form and split or break in drying, so that their preservation in the glass cases of our museums is a matter of considerable difficulty.[2]

[1] See Sir John Evans, *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain*, p. 145, figs. 100 and 101.

[2] In order to preserve the handles of axes or hammers, or other

As we have already said, perforated axes (figs. 115 and 116) are rather rare in the neolithic period, but very

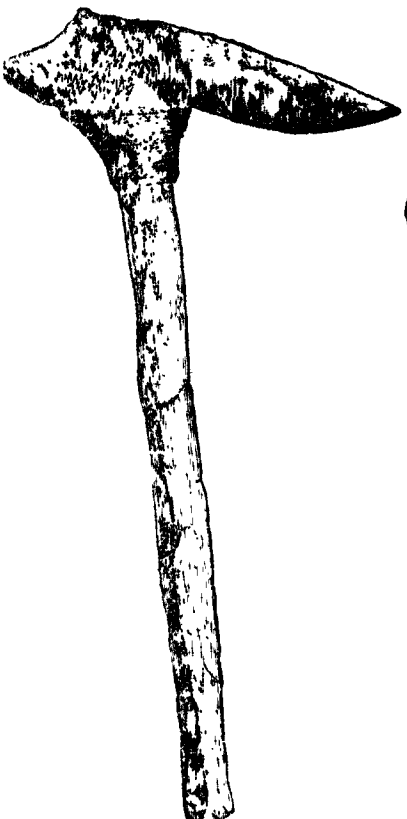


FIG. 113. AXE, WITH HANDLE (TAHITI). (After Lubbock.)

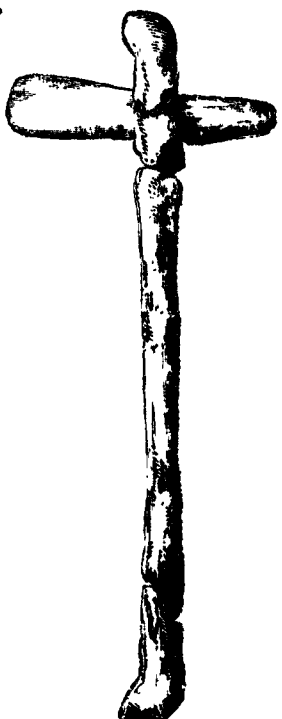
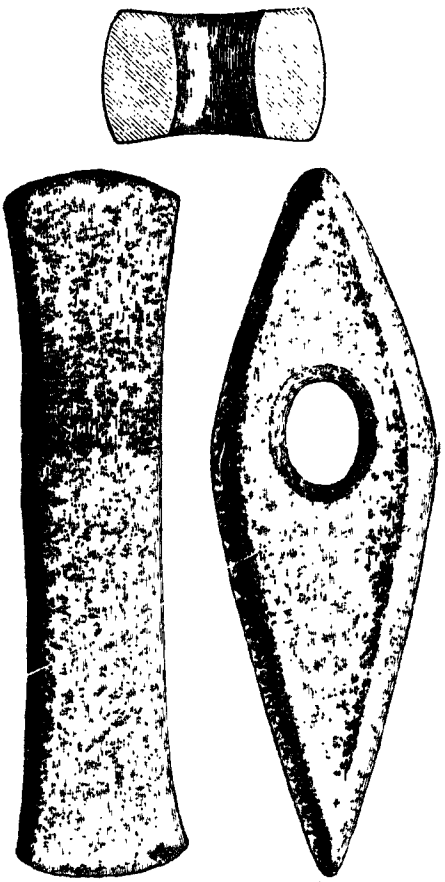


FIG. 114. POLISHED STONE AXE, WITH HANDLE (SOLWAY MOSS). (After Evans).

wooden articles extracted from the mud of the lakes or from the peat mosses, M. Englehardt has employed a process which appears to have been successful. His method consists in plunging or even boiling the articles in a strong solution of alum, and allowing them to dry slowly, and they then preserve their original form.

common in the age of bronze. A few of the latter, single or double edged, are very elegant forms, resembling those



FIGS. 115, 116. PERFORATED, POLISHED, DOUBLE-EDGED AXE (YORKSHIRE) (After Evans.)

of our metal axes.[1] It is sufficient to notice here, in

[1] See Sir John Evans, *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain*, figs. 91, 93, 94, 95, 98, and 100.

passing, those which are generally known as the Amazon axes, of which the narrower side, hollowed into a double crescent, was perforated for the reception of the handle, and of which the two extremities were terminated in a doubly-sloped and nearly half-circular edge. We need also only mention the hammer axes (fig. 117), of which the name sufficiently indicates the form and purpose.

Axes of smaller size, and especially those made from rocks foreign to the district where they are found, were merely inserted perpendicularly in the piece of stag's horn which served as a handle, and are rather knives than axes properly so called. Others, without a handle, were held in the hand like a cold chisel, and were marked by a circular groove that they might be grasped more easily and firmly.

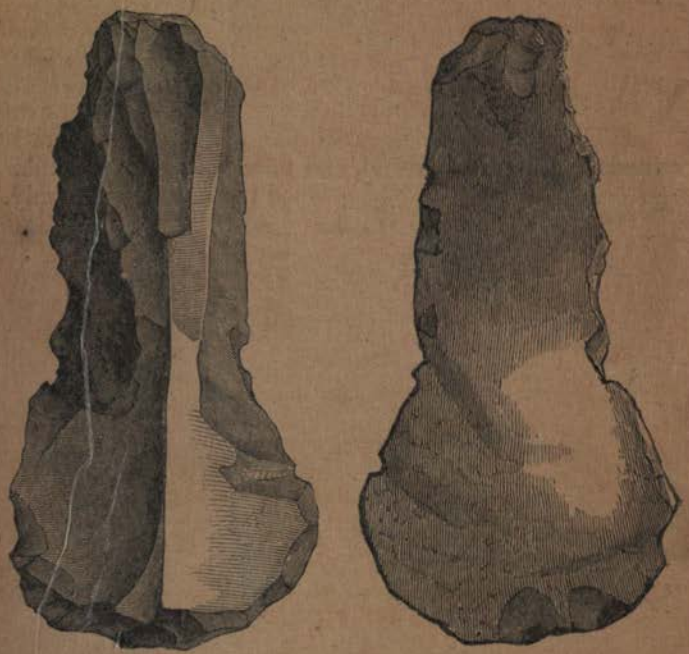
FIG. 117. DIORITE HAMMER AXE. (After Evans.)

Hitherto we have only spoken of axes for war or for useful purposes; the edge of all of these is parallel to the handle. There are others of which the edge is perpendicular to the shaft; these are the chip axes, whose form and general use recall the adzes of our carpenters. Other somewhat massive tools, of which one surface is markedly convex, the other slightly concave and the edge rounded, are considered to be primitive hoes employed in agriculture. Among the implements with a transverse edge we may also mention the supposed *throwing axes*, which appear to be nothing but wedges with slender handles, which were held in the left hand and struck with blows from the mallet (Nilsson).

We need likewise only mention—

1. Stone chisels, with or without handles, similar in every respect to those in use among the inhabitants of Tahiti and New Zealand.

2. Gouges or chisels, with a semicircular edge and more or less wide, intended for hollowing wood, similar to



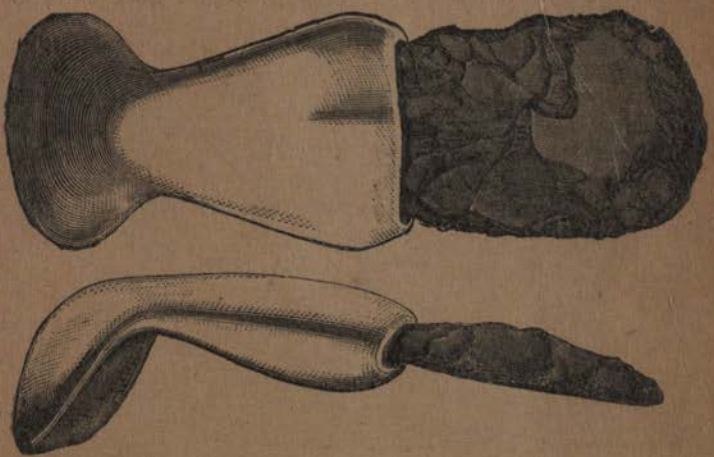
FIGS. 118, 119. FLINT SCRAPER. (After Lubbock.)

those still employed by the North American Indians to hollow the tree trunks for their canoes.

3. The *scrapers* and *smoothers* in flint or bone for removing the hair from skins or to smooth leather (figs. 118 and 119), very similar to those employed for like purposes by the Greenlanders and the Esquimaux (figs. 120 and 121).

4. The drills with a transverse edge like that of a chisel, a species of auger in basalt, diorite or serpentine, rarely in flint, since this rock would be too liable to break in the operation of drilling.

5. Lastly, I shall mention, to prevent mistakes in date, those polished tools transformed into other rough hewn tools; for example, a polished axe changed into a chisel, a knife become a saw or a lance head. For we shall not know in what epoch to class these ambiguous tools if the metamorphosis which they have undergone is overlooked.



FIGS. 120, 121. ESQUIMAUX SCRAPER, SEEN IN FRONT AND IN PROFILE. (After Evans.)

6. Among the most useful tools we must not forget to mention the hand saw, so often used in the manufacture of bone implements. This flint saw, usually very small, was inserted, we have said, in a handle of stag's horn longitudinally grooved, in which it was retained by a viscous substance resembling cobbler's wax. It must have been often broken, and yet it must have cost infinite skill and patience to obtain those fine teeth which we admire on the specimens in the museums of Switzerland, St. Germain-en-Laye, Toulouse, Montauban, &c. (See above, fig. 33).

Like many other stone implements, the saws have been found in considerable numbers in certain caves of the reindeer age; in that of Bruniquel, for instance, and more rarely in other caves of Dordogne. They occur in the burial places of the neolithic age in France, in the dolmens of Poitou, but they are generally rare in the latter, and in those of Great Britain and Ireland.

Among the instruments in domestic use during the age of polished stone, we must reckon the mortars for bruising grains, and especially cereals. The primitive mortars are very similar to those of modern times. They

FIG. 122. STONE MORTAR AND PESTLE, FOUND AT TY-MAWR (HOLYHEAD). (After Evans.)

are made of hard rock, such as granite, diorite, gneiss, and their upper surface is more or less hollow. The pestle was also of stone, spherical or oval in form, or else club shaped. Shallow depressions were made in the spherical pestles to render them more easily grasped. If the age of several of these mortars is sometimes doubtful, this is not the case with regard to the hand mills found in the Swiss lakes; they belong incontestably to the most ancient lake dwellings. We have said that they were used for grinding the corn which served to make the circular loaves or cakes found at Robenhausen. The grain which was in-

tended for this purpose was sometimes previously boiled, probably in order to facilitate the operation of crushing it.

VI. WEAVING AND SEWING.

After food comes clothing; hence spinning and weaving are of the most remote antiquity (figs. 123, 124). Wooden spindles and tissues of linen and bark have been found in the Swiss lake dwellings. Perforated discs of stone or clay, used as spindle weights, are extremely common (fig. 125). One of them was still attached to the spindle at the

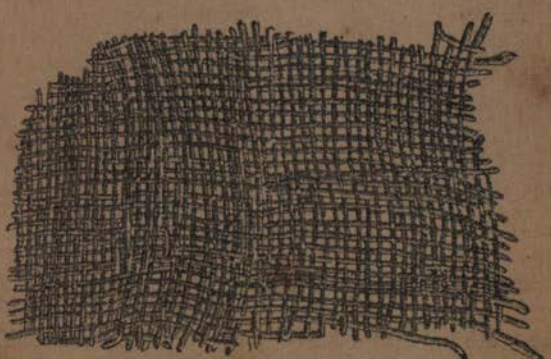


FIG. 123. PIECE OF TISSUE FOUND AT ROBENHAUSEN. (After Lubbock.)

time it was discovered. Linen thread or bark fibre was used to sew the garments of woven stuffs or of skins in which the inhabitants of the lake cities clothed themselves. Those of the caves used a thread made from split tendons, perhaps even strings of gut. There is no doubt that the art of sewing was very early known, since needles have been found in the caves of France and Great Britain, as well as in the Swiss lakes, belonging to the archæolithic or reindeer age.[1] Some of the latter, pointed at both

[1] Bone needles occur in nearly all the caves of Dordogne, at Massat (department of Ariège), at Lourdes (Hautes-Pyrénées), at Veyrier, at the foot of Mount Salève, as well as in various districts of Switzerland, and even in the neighbourhood of Bethlehem, the latter bearing an exact resemblance to those of our stations of the reindeer age.

ends, were perforated in the middle where the needle is thickest, similar in this respect to some bronze needles which were doubtless copied exactly from the former. Other bone needles have the eye pierced at the larger end. A few of these found at Bruniquet are so fine, that they

FIG. 124. WEAVER'S SHUTTLE OF THE AGE OF POLISHED STONE. (After Lubbock.)

FIG. 125. SPINDLE WEIGHT IN RED SANDSTONE, FOUND AT HOLYHEAD. (After Evans.)

must have been employed in more delicate work than the sewing of skins.

The bone needles of Périgord (figs. 126 and 127) are remarkable for the delicacy and finish displayed in their workmanship. In both respects they are superior to those

FIGS. 126, 127. BONE NEEDLES FROM THE CAVES OF PÉRIGORD. (After Broca.)

of the ancient Gauls, and to the ivory needles of the modern Esquimaux, and still more so to those of the Kamtskatchans, which are merely fish bones. In any case that which is especially admirable in the bone needles of Languedoc and Périgord, is the skill with which the boring of the eyes with a flint drill was accomplished; but with

skill and patience M. Ed. Lartet perfectly succeeded in this operation.[1] Like the hand-mills and spindles, the needles indicate occupations already essentially domestic—the chimney corner, a special part for the woman to fill, family life, and consequently an established polity already in the path of civilization.

Fish-hooks, awls, bone pins for fastening the dress or the hair, or even for ornament, are also of frequent occurrence in the caves and among the earliest lake dwellings. These are certainly very unpretending implements, like the needles which accompany them, and of whose usefulness long habit has rendered us unobservant. But we shall better understand their importance when we consider the essential part they played in primitive societies, and that which they still hold in our modern industry. Remember the millions of hands which are employed in their manufacture and use, and how the needles with which she had provided herself to distribute on occasion protected the renowned and courageous traveller, Ida Pfeiffer, from the cannibals of the Malay Archipelago.

[1] See in the *Reliquiæ Aquitanicæ* the interesting details which MM. Ed. Lartet and Christy have given respecting the making of these needles.

CHAPTER III.

AGRICULTURE.

I. PRIMITIVE AGRICULTURE.

If we belonged to that happy time when the lively imagination of men took delight in poetical symbols, we might represent civilization under the form of a strong, fair woman, bearing in one hand an ear of corn, in the other a book, the ear providing man with food for maintaining and strengthening the body, the book furnishing him with intellectual and moral nourishment which completes and ennobles his nature, ever hungering for knowledge and progress.

Not without reason, then, were Ceres and Triptolemus, the reputed inventors of the plough and of agriculture, ranked with Orpheus and Amphion as the first instructors of the human race.

When we think of the many and various blessings which result from the tillage of the fields, we easily understand how the ancient Scythians believed, as Herodotus avers, in the divine origin of the plough. Among the primitive inhabitants of Germany the belief was current that the ploughshare fell from heaven, and a temple was raised on the spot where it touched the earth. An old and simple German legend tells us how the daughter of a giant, filled with wonder at the strange sight of a man engaged in ploughing his field, bore away in one of the folds of her dress the pigmy labourer, his plough, and his oxen. The father of the girl was angry with her, and bade her put the *earth worm* where she had found it, foreseeing that the race of giants must soon die out before the efforts of man's intelligence.

The period of the giants, a race of nomadic shepherds, preceded that of the dwarfs—that is, those who practised agriculture and worked in metals.

The former represent brute force and savage instincts; these belong to the stone age. The dwarfs, on the other hand, their adversaries according to the Germanic legend, are the living symbol of the strife between mind and matter, the earliest pioneers of civilization; they belong to the age of bronze. I need not name the divine labourer of the Chinese, amongst whom agriculture is held in such high honour that the Emperor himself traces each year the first furrow.

There is no tradition, no written history, to tell us at what epoch men began to till the land. Like the child who retains no remembrance of his earliest years, nations have lost the memory of the successive stages through which they passed before casting off the swaddling clothes of ignorance and barbarism. None of them can tell us the origin of the simplest form of plough, still less the name of its inventor. But where history is silent mythology raises her gentle voice, and infuses into the mind of man those poetic fictions which have come down to us through the ages in place of truth.

In the fulness of time science was born; she penetrates into the virgin forest of the New World, which is perhaps the most ancient, and finds there, among the gigantic ruins of Uxmal or of Palenque, monuments which recall to mind Egypt and its gloomy splendours. She questions the tumuli of the Ohio, the dolmens of Brittany, the long barrows of Scotland, and the ashes of the dead make answer. She searches the cave dwellings of primitive man, she sounds the lakes at the bottom of which he built his early habitations, and she reconstructs from the often mutilated remains which she finds therein a whole world, with its character, its customs, its arts, industry, and agriculture.

In order to discover the first distinct traces of the culture of the fields, we must go back to the time of the builders of the lake cities of the neolithic age. Neither

the dwellers in the caves of the period of the bear or of the reindeer, nor the constructors of the Danish kitchen middens, knew anything of agriculture. In Switzerland, on the other hand, and perhaps in Italy, most of our cereals were already in cultivation before the age of bronze, maize always excepted. Several bushels of barley and wheat were found at Wangen; and Robenhausen has also furnished ears of the same grains, carbonised at the time of the burning of the lake cities, a circumstance to which they owe their preservation. A fact which is especially calculated to excite wonder is that at this remote epoch several varieties of barley and wheat already existed. Thus Professor Heer has distinguished the *Triticum vulgare*, *T. dicoccum* and *T. monococcum*. He recognised also the *Hordeum distichum*, or double-ranked barley, which is, however, rarer in Switzerland than the *Hordeum hexastichum*, a variety which is common in the ancient tombs of Greece and Egypt. Among the cereals we must likewise reckon two species of millet, *Setaria italica* and *Panicum miliaceum*, which are still used for food in some countries.

Among leguminous plants we find peas, lentils, and the little March bean, *Faba vulgaris celtica*. The fruit of the wild and cultivated apple trees, pears, plums, sloes, cherries, strawberries, raspberries, blackberries, hazel nuts, beech nuts, acorns, &c., preserved in rude hand-turned vessels, formed part of the vegetable food of the earliest inhabitants of Switzerland. We may add to the list the fruit of a species of plum of the Scotch and marsh firs, of the service tree, of the water chestnut, and even of the yellow water lily.

It has been remarked that the apples and pears were cut in quarters to allow of their being more easily dried. We have not mentioned the walnut in our list of edible fruits: it is probable that this tree was already no longer indigenous in Europe, as it was during the epoch of the great mammalia, but had disappeared with the *thuya* and the *liquidambar*.

We must not conclude this chapter on agriculture and

its products without saying a few words about the textile plants.

Hemp was unknown, but flax was cultivated by the inhabitants of the lake dwellings. The seed has been found in abundance, and also the nets and woven or plaited tissues manufactured from it. The weaver's loom and shuttle, the spinner's spindle and accessories, such as weights to stretch the thread, &c., already existed. Ropes and cordage were made from twisted linen thread and bark fibre; straw and osiers were used, the former for plaiting, the latter for making baskets and bird-nets for fishing. Agricultural implements, as may be supposed, were of the simplest, resembling those in use among some of the islanders of Polynesia.

MM. Boucher de Perthes, Garrigon, and Filhol have suggested that stags' antlers, deprived of all their branches but one, the lower jawbone of *Ursus spelæus*, branches of trees forming a more or less open angle, &c., might have served as pickaxes and hoes at a time when the yet virgin soil must have been extremely fertile without the need of deep ploughing.

It is certain that several savage and even cannibal tribes still employ for tilling the soil tools quite as primitive as those used by the earliest inhabitants of Central Europe. The ribs of the whale, or billets of wood shaped like gouges, are used as spades. The clods raised by the piece of wood are broken up with a small roller. Their hoe is an oyster or tortoise shell firmly fixed to the end of a stick; a sharp shell serves as a pruning knife. Non-metallic agricultural tools similar to the spade or shovel have not yet been found in Europe. Sir John Evans has only found in England some flint hoes. But in North America, to the south of the Illinois, and on the banks of the Mississippi, some carved flints of a large size and of unknown date were discovered, which it is surmised were used as spades by the primitive inhabitants. These implements are oval or elliptical in form, flat on one side, slightly convex on the other, with sharp and regularly toothed edges, and measuring more than a foot in length.

by five or six inches wide and three-quarters of an inch thick in the middle. Professor Rau has given illustrations and descriptions of similar hoes and shovels also found in North America ('Archæological Collection of the United States' National Museum,' by Charles Rau. Washington, 1876. Figs. 54 and 55).

These rude implements are far removed indeed from the reaping machines and steam ploughs of to-day; but this is only an additional proof of the vast progress of humanity.

II. THE DOMESTICATION OF ANIMALS.

When we consider the immense difficulties which primitive man must have encountered in the task of subduing an animal so powerful as the wild bull, so swift as the horse, so fierce as the dog in its natural state, we may well wonder how he could tame these wild creatures, and not only render them useful allies and devoted servants, but also make them trusted friends.

Any conclusion upon questions relating to the domestication of animals is rendered especially difficult on account of the uncertainty under which we labour with regard to the traces of modifications observed upon fossil bones; we cannot tell whether these modifications are natural or due to the intervention of man, since either cause would produce the same effect. Great discrimination is required to divine the real agent; and doubt, error, and uncertainty still reign with regard to many of the questions which we are about to consider.

It has been well said that 'animals could exist, and have existed, without man, whereas man could not exist without animals.'

But people are too apt to forget the innumerable difficulties which may have long interfered with the entire subjugation of the animals we now call domestic. Now that the work is accomplished nothing seems to us more simple than domestication, that association between the beast and man, his master, and too often his tyrant.

It is true that there is nothing voluntary in this asso-

ciation on the part of the animal, and as M. Bouley says, with as much wit as justice, the lamb did not come of its own accord a submissive victim to bow its innocent head, like Iphigenia beneath the steel of Calchas, nor did the bull voluntarily submit its neck to the yoke, nor the horse open its mouth to receive the bit. Even now, these servants, whom we believe to be completely enslaved to our will, retain their inborn instinct of independence, and it is only by ceaseless effort that man succeeds in rendering dormant in some of them that love of liberty which exists in all.

But man has discovered and turned to account in most of the animals he has subjected to his rule an instinct of sociability, existing together with the love of independence and predisposing them to domestication. Here once more his intelligence created him king; his absolute authority was accepted in place of that of the chief naturally chosen by the herd when still possessed of liberty.

This same intelligence enabled him to discern among the beasts of the forest those which would be most useful to him by furnishing him with flesh, milk, muscular strength, soft warm fur—all the resources of their instinctive and sagacious faculties. In this respect the work of our earliest ancestors is so complete, that the lapse of many centuries has added but little to the riches acquired by them.

What species of wild animal was first chosen for domestication, and at what epoch it was first tamed, is a question which has been often discussed, and which has nevertheless received hitherto no satisfactory answer. Palæontology, however, has lately added another argument in favour of the opinion of those who hold that the dog was the first animal subjected to the dominion of man. Professor Steenstrup, of Copenhagen, has proved in a most original way that the dog hunted with man and shared his repasts at that remote epoch when the savage inhabitants of Denmark heaped up along the coast of the Baltic the enormous kitchen middens.

M. Ed. Dupont, for his part, has met with the *canis*

familiaris in the palæolithic caves of Belgium—that is, in settlements still older than the kitchen middens. It is true that the learned director of the Natural History Museum of Brussels does not assert as a positive fact, but merely supposes, that this animal was very early domesticated. For it is easy to conceive the useful and indispensable aid the dog must have afforded to man armed only with the axe, the mace, or the arrow of stone, with which to strike the prey that he pursued in its flight or attacked in a hand-to-hand combat. The eminently sociable disposition of the dog, the innumerable varieties which the species present, and its valuable qualities, natural or acquired, all tend to prove that it was one of the earliest companions of man, whom it has never since abandoned, whom it has everywhere followed, and of whom it constitutes the better part, if we are to believe the witty author of 'L'Esprit des Bêtes' (Townsend).

It is also Townsend who said: 'The dog is the greatest conquest man ever made, if M. Buffon will allow me to say so. The dog is the first element in human progress. Without the dog man would have been condemned to vegetate eternally in the swaddling clothes of savagery. It was the dog which effected the passage of human society from the savage to the patriarchal state, in making possible the guardianship of the flock. Without the dog there could be no flocks and herds; without the flock there is no assured livelihood, no leg of mutton, no roast beef, no wool, no blanket, no time to spare; and, consequently, no astronomical observations, no science, no industry. It is to the dog that man owes his hours of leisure' ('L'Esprit des Bêtes,' p. 149, Paris, 1868).

There is a great deal of truth in this ingenious trifling. Once subjected to the all-powerful influence of man, aided by the dog, and transported by him into all climates, our animals, slaves at first, and at last domestic, have undergone in the successive ages a series of modifications in outward form, size, and the proportions of their limbs, in their fur and skin, in their interior organs and their functions, in their instincts and intelligence.

The history of these wonderful and almost infinite varieties has been treated by a master hand in a book which soon became classic, and was translated into several languages, and in which we do not know whether to admire most the profound science, the accurate observation, the great number of facts on which it is based, or the logic of its deductions and breadth of its views, though hypotheses sometimes border on rashness. I need hardly say that I allude to Darwin's important work, 'Animals and Plants under Domestication.' To this book, crammed with facts and ideas, I refer those of my readers who may be desirous of knowing how far the power of man over animated nature can extend, without prejudicing, of course, the immense influence he exercises over inorganic nature. It is enough to mention here the infinite variety of breeds of dogs, horses, oxen, sheep, pigs, fowls, pigeons, &c., which man has created, and still creates, either for use or to gratify his caprice. Compare the Newfoundland dog with the King Charles spaniel, of which the breed is dying out; the Turkish hairless dog with the fleecy Maltese breed; the long-limbed, sharp-nosed greyhound with the bow-legged bulldog with the short broad muzzle; compare the Arab horse, so swift in its course, with the heavy, but powerful dray horse; the bison of America, with its monstrous head, with our Breton or Alderney cow; the ancona sheep of Massachusetts with the Leicester or merino breed, and say whether man is not also a creator. A great number of analogous examples might be cited from our gallinaceous breeds, from our geese and pigeons, if I had the space or the wish to pass them all in review. The list would be endless if we came to consider the instincts acquired or lost, the fecundity increased or diminished, the diet completely changed, the acclimatisation and naturalisation of exotic species, &c.

I know that some *savants*, few in number, it is true, still maintain, in spite of the most significant facts, that each one of our domestic breeds was created in its present form and on purpose for man, from the beginning; and that it has since remained absolutely unchanged. This

remarkable theory does not even deserve a serious reflection.

We may therefore conclude: first, that taking into consideration the effects obtained by domestication, the power of man is immense. But however great it may be, he must, in order to obtain new varieties, call to his aid the no less powerful influence of surrounding circumstances; secondly, that all domestic animals owe to a naturally social instinct their condition of servitude, to which they were reduced by accepting man as their master.

III. ORIGIN AND HOME OF OUR PRINCIPAL DOMESTIC ANIMALS.

We owe to M. Pictet the important remark that in Switzerland as elsewhere the diluvian fauna passes gradually into the modern. Thus the urus (*Bos primigenius*) is associated in the leaf-impressed coal of Dürnten, in the canton of Zurich, with the *Rhinoceros leptorhinus* and the *Elephas antiquus*. Later it lived in company with the mammoth in the Rhine valley; still later with the reindeer and the marmozet; lastly, at Robenhausen, we find it with the aurochs, when it became the object of the attacks of man, who finally extinguished the species. 'At the time of Cæsar, the *urus*, the elk, the aurochs, still roamed through the Hercynian forest. In the course of the seven following centuries the two latter were exiled to the north. The change was doubtless brought about by other causes than any modification in climate; but we must look to some change in temperature to account for the fact that the two species which formerly existed side by side in the Swiss valleys, the reindeer and the elephant, are to-day separated from each other by half the meridian of the globe.'[1]

[1] Universal Library of Geneva, *Archives*, vol. xii. 1861, p. 299. It is true that Africa and even America may claim the honour of having furnished several of our domestic species. Marsh goes even further, and affirms that all the species reduced by man to a state of domestication came originally from the New World. Carl Vogt, on the other hand, pronounces in favour of Africa. The question is then still open, but we have no doubt that future palæontological discoveries will sooner or later throw light upon the matter.

This gradual passage from the diluvian fauna to that of the present day shows us several important facts. In the first place it allows us to attribute certain specific types to more remote epochs than is generally admitted. Moreover, it authorises us to seek in these same types the original stocks of most if not of all of our domestic breeds. Now, as every genus from which the latter are descended exists in a fossil state, either in the tertiary beds or in the diluvian strata of Europe as well as in those of Asia, there is already a strong presumption in favour of the European origin of our modern breeds.

Hence it is only natural and logical to conclude that the diluvian species above mentioned survived the great inundation which overwhelmed a great part of Europe at the beginning of the fourth epoch, and produced the domestic animals of the period of polished stone, which themselves are the ancestors of our modern breeds.

Besides, how can we reasonably attribute an Asiatic origin to those animals under domestication as early as the period of the most ancient lake dwellings, and even, as we shall prove, during the palæolithic age, that is to say, long before the first Aryan migrations of which history makes mention? The most ancient monuments, moreover, bear witness to the existence at the time of their construction, more than sixty centuries before Christ, of several of our modern breeds, or at any rate of very similar ones. There can be no doubt of this fact when we see, for instance, on the Egyptian monuments hunting-dogs with short nose and hanging ears, and greyhounds with upright ears, which closely resemble in general build those employed in the chase by modern Egyptians.

M. Saint-Hilaire himself, although an avowed partisan and zealous promoter of the opinion which attributes an Eastern origin to most of our domestic mammalia, considers the different varieties of dogs above mentioned as breeds already considerably modified by culture; 'so much so,' he says, 'that it is impossible not to fix the date of their domestication at a very early epoch, even compared with that remote period when we see them in company

with the Egyptian hunters.' ('Acclimatation et Domestication des Animaux Utiles,' p. 214.)

And what is that remote period, when compared with that of the stone age, during which we find the dog of the kitchen middens in Denmark; the horse at Solutré (reindeer age); and a hound resembling our spaniel, as well as several oxen, bearing the unmistakable character of a domesticated condition, in Switzerland?

Besides, if the dog, the ox, the horse, &c., were imported from Asia by the Aryan emigrants, it is hardly probable that they would not have been accompanied by the Indian elephant and the Bactrian camel; we ought, therefore, to find the bones of these two species mixed with those of the dogs, the oxen, the goats, the sheep and pigs which they are said to have brought with them. Now no such discovery has hitherto been made in Europe, and no European legend makes mention either of the camel or the elephant, which figure largely in Hindu mythology. Our domestic animals may therefore have an European origin, and this origin, like that of man himself, is far more remote than was at first supposed.

De Blainville tells us in his 'Ostéographie' that none of the modern wild species produced the domestic dog, but that its original stock is a species which existed during the diluvian period, and which is known to palæontologists as *canis familiaris fossilis*. The remains of this species are found in more or less abundance in the caves of France, Belgium, and Germany. It is not unreasonable to suppose that this dog was tamed by the first inhabitants of our continent, and that it passed from their hands into those of the builders of the lake cities and of the dolmens, precisely as the reindeer of the period of the caves became domesticated among the Lapps. M. de Mortillet also admits that the *canis familiaris fossilis* may have been the ancestor of our domestic dog. We have already said that the earliest traces of the domestication of the dog were found by Professor Steenstrup in the kitchen middens, and the same *savant* believes that

this animal was domesticated in Belgium in the age of the mammoth.

Having observed that all the bones of birds mixed with the other remains only retained their diaphysus or shaft, which is the hardest part, while the heads or extremities had as a rule completely disappeared, Steenstrup gave similar bones to domestic dogs to gnaw: they only left the shaft, on which their teeth made marks precisely similar to those observed on the bones taken from the kitchen middens. Hence Steenstrup concluded that the dog was already the companion of the primitive Dane in the chase, and the sharer of his meals. It might be objected, certainly, that the bones of birds which form part of the kitchen refuse might have been gnawed by wild dogs, wolves, or foxes; but the fact is too general, and tallies too exactly with the experiment undertaken in proof of the Professor's theory, to allow of our refusing to attach any faith to the latter.

If this conclusion were proved to be strictly correct, the domestication of the dog took place at a very early epoch—at the period of the oldest lake dwellings of the neolithic age, and perhaps even earlier. Now in the lake cities two distinct species of dogs were found, as we have seen: the one intermediate in size between the watch-dog and the pointer; the other, more recent than the preceding, resembling our sheep-dog.

It is a remarkable fact that the dog is not mentioned in the earlier books of the Bible. Moses does not speak of it, and there is no mention of it in the book of Joshua or in that of Judges. 'We may assume, therefore, that before the time of the kings the Hebrews did not possess the dog, although they must have known this animal in Egypt, where it was domesticated long before the days of Abraham. The name of the dog occurs first in the Bible in the Second Book of Samuel, which tells us no more than that the expression, "head of a dog," was an insult in the time of David; then the author of the Second Book of Kings mentions dogs, but only to relate that they devoured the body of Jezebel. It would seem that

the Hebrews had not learnt to appreciate the good qualities of this animal, a circumstance by no means to their credit.'[1]

The dog is, as we have said, faithfully represented on the most ancient Egyptian tombs. It is even figured in a leash and with a collar round the neck. It is therefore certain that the Egyptians domesticated this animal, and had obtained several breeds distinct from the original stock, whatever that might be.[2]

We say original *stock* and not *stocks*, for while we admit that all the canine breeds may have sprung from several different varieties, we believe that all European dogs are descended from the single *canis familiaris fossilis*, and not from any species of Eastern origin. Moreover, with respect to the greater number of our European domestic species, unity of ancestral savage type is the rule, multiplicity the exception.[3]

'It is to be presumed,' says M. H. Milne-Edwards, 'that the domestication of each species of the horse family took place in the country to which it is indigenous in a wild state, and, consequently, that the ass was tamed in Africa, and the horse in the regions occupied by the Aryan race.' But he is careful to add, 'the horse seems to have been originally a native of Central Asia and of a part of Europe' (*Comptes-rendus de l'Institut*, Dec. 13, 1869).

M. Milne-Edwards admits, then, that the horse had an European as well as an Asiatic origin.[4] How can the

[1] Universal Library of Geneva, vol. 35, p. 568.

[2] According to M. Toussaint the breeds represented on the most ancient monuments of Egypt are a greyhound with narrow ears, a mastiff, a poodle, and a dog with hanging ears. (See E. Toussaint, *Etude sur l'Origine du Chien domestique.*)

[3] We do not understand how, after having laid down this principle, which appears to be the expression of the truth, Hæckel could say almost immediately afterwards that 'a domestic breed is never descended from a single corresponding wild species.' (*History of Creation.*)

[4] We must also attribute an African origin to the horse, if it is true that a type with five lumbar vertebræ exists, which Sanson says is peculiar to Africa, while the Asiatic type has six. Finally, Mr. Marsh says boldly: 'It is now generally admitted that the horse is indigenous in America.' (*Revue Scientifique*, 1878, p. 1,071.)

former be denied when we see the horse so often represented on reindeer horn, carved or engraved by the artist hunters of Languedoc and Périgord? Is not the faithful representation not only of the reindeer, but also of the mammoth, the ox, the saïga, the horse, the pig, &c., proof positive that the artists had these animals under their eyes and almost close to their hand, since they fed upon their flesh and hunted them continually? These horses of the fourth epoch, at first wild, probably became domestic a little later, that is, part of the human society, and were sheltered, cared for, made use of by the latter as it gradually advanced towards a condition of life less rude, less precarious, less adventurous. Is it likely that the aborigines of Europe, impelled by the same necessities, gifted with the same instincts, and guided by the same feelings as the peoples of Asia, waited until the precise moment of the invasion of the latter before thinking of taming an animal whose intelligence, strength, grace and rapidity of motion, not to speak of its thick hide and delicate flesh, they must have known equally well how to appreciate?

M. Toussaint for his part believes he has discovered traces of the domestication of the horse at the epoch of Solutré (reindeer age);[1] and long before Marcel de Serres had pointed out, in speaking of the bones of the same animal found in the caves of Bize and Lunel-Viel, modifications which led him to the same conclusions respecting an earlier epoch than that of Solutré. The cave of Lunel-

[1] In support of his conjectures M. Toussaint draws attention to the almost complete similarity of the bones of Solutré with those of the modern animal. The only difference consists in the absence, in the immense majority of adult specimens found in the Cros Charnier, of the union between the metacarpal and metatarsal rudimentary or lateral bones (stylets), and the principal metacarpal and metatarsal bones (the *canons* of veterinary surgeons). These bones are always united in the *equus caballus* of to-day. The great number of the bones, their age of four, five, or six years, the assemblage in one place of all the parts of the skeleton, are, according to M. Toussaint, indications that the horses of Solutré were killed, cut up, and eaten on the same spot as domestic animals, and not hunted in a wild state, and carried from a distance, and piecemeal, as was the case in the earliest caves of the archæolithic age. (Toussaint and l'Abbé Ducrost, *Du Cheval dans la station préhistorique de Solutré.*)

Viel belongs to the epoch of the cave bear and hyæna, and probably that of Bize also; but some archæologists attribute it to the reindeer age.

Professor Gervais dates the domestication of the horse from the glacial period. Lastly, in a recent work ('Das Europäische Wildpferd und dessen Beziehungen zum domesticirten Pferde'), which we regret to say we only know from the brief analysis which M. Vignier has made of it, Ecker propounded theories very similar to our own upon the origin of the domestic horse. He says that the European horse of the fourth epoch probably gave birth to the small stunted breed, with the large head, rounded forehead, and short neck, which is found in fossil at Solutré, and which is still represented by the wild horses of the Rhone delta, and of the steppes of Russia. But he adds that this primitive breed was almost entirely supplanted by an Asiatic breed, larger and more robust, and that our domestic horse is the result of the mixture of the two races; this seems probable, if not absolutely proved.

We may add, moreover, that as M. Pictet himself admits, the most trustworthy anatomists recognise that the great majority of the fossil remains of the horse found in Europe resemble so closely the bones of the *Equus caballus* of modern days, that it is almost impossible to distinguish them from each other. It is needless to draw the conclusion. This theory distances the opinion of some naturalists, and still more that of the Emir Abd-el-Kader, who maintained that Abraham was the tamer of the first Arab horse, from which the whole race is descended. So easily does national pride, joined to ignorance of fact, alter the history of nature!

I do not know on what precise documents M. Petermost founds his assertion, that the Aryans were in possession of the horse from the year 19,350 B.C.; what appears certain is that it existed in China 2,350 years before our era.

We have already mentioned that M. Milne-Edwards believes that the ass is of African origin, and M. F. Lenormant shares his opinion. Philology furnishes a proof in support of this theory, as the ass has a name of Semitic

origin, *aton* (plural *atnot*) the slow animal, while the Latin name of the horse is allied to the Sanscrit *açva*, the swift.[1]

To the data furnished by philology we may add those gathered from the representations on the ancient Egyptian monuments, and from the texts of the Bible, which all tend to confirm the opinion that the horse and the ass were originally natives of totally different countries. The horse was first domesticated on the high grounds of Central Asia, and the Aryan emigrations were the principal agent in its diffusion over the globe; it was tamed at a later date by the Semitic races, and only appeared in Egypt about 2,500 years before the Christian era. The ass is an African species, which was probably first domesticated on the banks of the Nile. From Egypt it early passed into the hands of Semitic tribes, who afterwards introduced it among the Aryans of Persia and Greece. This animal, which finally became universally used, took a direction exactly contrary to that of the horse. Starting from opposite points, they ended by meeting and by being almost everywhere employed together.' (*Comptes-rendus de l'Institut*, Feb. 7, 1870, p. 279.)

But etymologies, however learned, are by no means always valuable as proofs in questions of natural history; and, moreover, we should call attention to a fact concerning the ass similar to that observed with respect to the horse. The fossil remains of the former animal occur in the cave of Aurignac, in Belgium, and elsewhere. Why, then, may we not assume that it was domesticated by European man of the fourth epoch?

The Ox.—After a careful examination of the bones of the horse, the ox, the goat, the sheep, and the pig, found in the Belgian caves of the reindeer age, Professor Steenstrup thought he was justified in concluding that the

[1] From the plural *atnot* we have the primitive Greek form ἄτνος, which was succeeded by ὄνος, whence were derived *asinus*, *asellus*, *asilus* (Gothic), *asel* (Old English), *esil* (Old High German), *esel* (Modern German), and, lastly, ὄνος. M. Lenormant tells us, moreover, that *atnot* is from *atuna*, to walk slowly.

animals to which these bones had belonged were completely, or at any rate partly, domesticated. He, therefore, attributed to all of them a purely European origin, and this also is the opinion professed by Cuvier in his later works.

Besides the *urus* which the inhabitants of the lake cities of the neolithic age hunted in their forests, and which were still to be found there in the time of Cæsar, the lakes have preserved the remains of several bovine species from which Professor Rütimeyer, well known by his excellent works on the ancient fauna of Helvetia, Owen, and Darwin believe that several of our modern breeds are descended. Carl Vogt and Cuvier also attribute an European origin to the ox. All our domestic breeds of cattle, excepting those with a hump, are descended, according to Darwin, from three species, of which the fossil remains are to be found, but which no longer exist in a wild state; these are:—

1. *Bos primigenius*, domesticated in Switzerland from the epoch of polished stone, and resembling the modern Frisian breed of cattle.

2. *Bos longifrons* (*B. brachyceros*, Owen), contemporary in Switzerland with the preceding, and still domestic in England during the Roman occupation; this species is considered by Professor Owen to be the original stock from which the black cattle of Wales and the Scotch Highlands are descended.

3. Lastly the *Bos frontosus* (Nilsson) of Scandinavia, the companion of *Bos longifrons* in the fourth epoch, and afterwards reduced with the latter to a state of domestication.[1]

The paintings of the sepulchres of Ancient Egypt (paintings which go back nearly to the age of polished stone) represent several breeds of the bovine race already bearing the yoke and harnessed to the plough. Some even figure cows without horns, whose legs have been

[1] Carl Vogt considers *bos frontosus* and *bos longifrons* to be merely varieties of *bos primigenius*.

tied so that they might be milked in the presence of the calf, which is allowed to remain beside them.

Goat.—The same arguments which are urged in favour of attributing an European origin to our domestic dogs, horses, and oxen, apply also to the various kinds of goats, sheep, pigs, cats, and rabbits. Rare in the caves of the palæolithic age, common in the lake dwellings of the neolithic period, represented in the paintings of the fourth Egyptian dynasty with hanging ears like those of the modern breed in that country, mentioned by the primitive Aryans, in Genesis, Homer and Greek mythology (Amalthæa, the nurse of Zeus), the goat was domesticated from the earliest times. There is, therefore, no reason why we should not admit several primitive stocks from which, as in the case of the dog, the horse, and the ox, our modern breeds of goats are sprung. The principal appear to have been the wild goat of our mountains, perhaps the *Capra Hispanica*, discovered by Schimper; the wild goat of the mountains of Asia, or the *paseng* of the Persians; lastly the *Capra Falconeri*, native of India.

Sheep.—More recent than the goat, the sheep is nevertheless found with it in the lake dwellings, but it is rarer than the latter in those which date from the palæolithic age. In the lake cities of the age of bronze it only differs from our modern sheep in the form of its horns, which resemble those of the *Capra hircus*. According to M. Roger de Guimps, the sheep is not represented in the Egyptian paintings of the fourth dynasty, where, as we have seen, the figure of the goat frequently occurs. Domesticated under the name of *ovi* (whence ovis, *ŏïs*) among the primitive Aryans, the sheep was well known to the Hebrews and to the Greeks of the time of the siege of Troy. Homer makes frequent mention of them.

Opinions differ with respect to the original stock of our modern breeds of domestic sheep. It was long believed, and some naturalists still hold to this theory, that the modern *mouflon* of Sardinia and Northern Africa was the parent stock. Professor Gervais and M. Fitzinger believe that our modern breeds are descended from one or

more diluvian species now completely extinct; and this is also my opinion.

The Pig.—It seems little doubtful that the many different breeds of pigs are descended from several distinct species. Besides the wild boar, which is found in the caves, and which was easily tamed, we find in the earliest lake dwellings:—

1. A smaller species, known as the marsh pig (*Sus scrofa palustris*), and which appears to be the type of the porcine family in the Canton of the Grisons.

2. The large species found at Cuncise, very similar to our modern breed. Both species, supposing them not to be merely varieties of *Sus scrofa ferus*, are indigenous to Europe. Reckoned unclean by the Egyptians, the pig occurs nowhere in the paintings on the tombs. I need hardly say that it is also regarded as unfit for food by the Jews. It formed, on the contrary, a considerable item in the diet of the Greeks and of the Gauls. The primitive Aryans had domesticated this animal and used its flesh for food.

According to Nathusius all the breeds of pigs may be reduced to two principal types, which are osteologically different—the *Sus Indica* formerly diffused over all countries, from the extreme east of Asia, where it still exists in Siam, China, and Japan, to Western Europe; to this type belongs the *Sus scrofa palustris*. The other is the *Sus scrofa ferus*, or wild boar, whose habitat extends from the west of Europe eastward as far as India, and from which, in our own opinion, although some naturalists maintain the contrary, our modern domestic breed is sprung. We are assured, and M. de Guimps repeats, that when crossed these two species are extremely prolific, and that all the most improved English breeds are the result of the mixture of the two races.

Nearly all modern naturalists are agreed in considering the wild boar of the forests as the source of our domestic breeds. M. Sanson alone maintains the contrary opinion, based upon the fact that the wild boar has only five lumbar vertebræ, whereas the domestic pig has always, according

to him, six. The Chinese pig has only four. Can domestication, he asks, increase or diminish the number of vertebræ? Why not, since it has produced an extra toe upon the feet of some of our canine breeds, since it has completely modified the dental system of certain varieties of the same species—the greyhound and bulldog, for example; since it has completely removed the horns from a quite modern breed of cattle; since some of our domestic sheep have two and even four pairs of horns; since, finally, domestication has so completely altered the skeleton of some of our modern breeds of pigeons, that, were they found in a wild state, they would probably be considered as so many distinct genera? Moreover, it is well known that any organs in the form of a series, and the vertebræ more than any others, are subject to frequent numerical variations. The arguments urged by M. Sanson do not, therefore, seem to me to be sufficiently strong to change the generally received opinion as to the origin of the European domestic pig.

Cat.—The wild instincts of the cat prevented its early domestication. Its flesh, moreover, is unpalatable and its use inconsiderable. Hence we find it for the first time in Egypt, forming part of a group of bronze statuettes, which represents three divinities, at whose feet lies a cat suckling its young. Now this group, according to M. Roger de Guimps, is not earlier than 650 B.C.

The same author says that the mummies of cats of the ancient Egyptian tombs all belong to species then wild in that country, and of which at least two, the *Felis caligulata* and the *Felis bubastis*, retain their independence.

It was only in the middle ages that the domestic cat, unknown to the Aryans, to Moses, to Homer, Aristotle and Pliny, was introduced into Europe. On the other hand, M. Saint-Hilaire maintains that it was domesticated in Egypt from the earliest antiquity. Its original habitat was, he says, the north-east of Africa and the east of Asia, and all our feline breeds are descended from the gloved cat (*Felis maniculata*) of Nubia and Abyssinia, and perhaps also from an Asiatic species hitherto undetermined.

But why should we go so far to seek that which is perhaps to be found close at hand? Why should we not regard the *Catus ferus* of the quaternary beds as the ancestor of the *Catus ferus* of our forests, and the latter as the stock from which our domestic breed is sprung? Since the reindeer, the contemporary of the mammoth and cave-bear, has come down to us without losing its specific identity, why should it not be the same in the case of the cat and many animals of which man has made conquest, and with whose typical representants, since modified, his bones, or the products of his primitive industry, are mingled?

Rabbit—Hare.—Among our domestic animals there is one in particular to which it is impossible to attribute an Asiatic origin, namely, the rabbit, the *Lepus cuniculus* of Linnæus. Unknown to Aristotle, who makes no mention of it, and even to Xenophon, whatever Cuvier may say, the rabbit was still uncommon in Greece and Italy towards the beginning of the second century before the Christian era. In the present geographical period it seems to have been first domesticated in Spain, and later in France; but it soon multiplied there to such a degree, especially in the south, that 'this pernicious animal,' says Strabo, extended its ravages from Spain to Marseilles. In the time of Pliny the breed had become so numerous that the inhabitants of the Balearic Isles were constrained to seek military aid against the rabbits: *Auxilium militare a divo Augusto petitum.*

The remains of the hare and of the rabbit are abundant in the diluvian beds of France; there is no reason, therefore, to prevent our considering the rabbit found in a fossil condition in Central Europe (*Lepus priscus*, Piette) as the source of our domestic breeds. But this domestication took place late probably, if it is true that primitive European man long rejected as unclean the flesh of *Lepus timidus*.[1] It is certain that Ed. Lartet discovered none

[1] It is well known that the Jews also considered the flesh of the hare and rabbit unclean. The Romans were far from sharing this repugnance; for Martial does homage to the hare in the verse:—

Inter quadrupedes gloria prima lepus.

of the bones of the hare in those of the Pyrenean caves which were inhabited exclusively by man, neither have any been found in the Danish kitchen middens. In our own day the Lapps and a few other European tribes still hold the flesh of the hare and rabbit in abhorrence.

Reindeer.—The question as to whether or no this animal was domesticated by quaternary man is still an open one. But who would dream of looking for its original home on the banks of the Oxus or of the Ganges? Is it not more natural to suppose that it was at least partly domesticated towards the end of the period which bears its name, and in those districts where its bones are now found? Such at least is the opinion of Virchow and of Fraas, who date the domestication of the reindeer in Germany from about the time of the cave of La Madelaine.[1] MM. Gervais and Piette also admit the domestication of the reindeer in the latter half of the palæolithic age. Dr. Noulet seems disposed to think that from the beginning of the fourth epoch the reindeer filled an important position in the life of those families who had made themselves masters of it; but this subject, like so many others under our consideration, requires renewed and more accurate investigation.

According to Rütimeyer the cave of Kesslerloch has furnished no proof that its inhabitants were in possession of domestic animals. The almost complete absence of dogs makes this supposition highly probable. However, the repose of the attitude of the horse, the truth of that of the pig in the drawings they have made of those animals, are an argument in favour of the contrary opinion. However this may be, we have under our eyes

[1] M. Fraas adduces philological grounds whose strict accuracy we cannot warrant in support of his opinion. *Rindvieh* in German, he says, means large cattle. Now the root of this word is *rennen*, to run, whence *Rennthier*, the swift animal *par excellence*. Hence he concludes that the domestication of the reindeer preceded that of the ox which replaced it, and of which the wild stock has retained the name of *Urochs*. Even after the ox had begun to share the labour of man the herds of large cattle were still known as *Rindvieh*, that is to say, reindeer herds.

the remains of an ancient fauna uniting in a single spot animals now scattered over every part of the earth, and whose simultaneous existence, as Mlle. J. Mestorf justly remarks, was not formerly even suspected.

Birds.—We will say nothing of the birds, reptiles, or fishes found in the caves, in the kitchen middens, or beneath the lake dwellings, since it is agreed by all the authors who have written upon this subject, that no species of any of these three classes was domesticated by the primitive Europeans, or, more properly speaking, by the Europeans anterior to the Aryans.

Invertebrate Animals.—There is nothing to show that quaternary European man turned any of these to account. He might perhaps have gathered the honey of the bee, which has been since domesticated; but it is clear that he knew nothing of the silkworm, cultivated by the Chinese, who knew how to spin its silk 2,700 years before our era.

Conclusions.—To sum up: the greater number of our domestic animals, commonly regarded as originally natives of Central Asia, are on the contrary of European origin. Their primitive stock, whether single or multiple, it matters little which, goes back in the case of many of them to a remote geological antiquity, that is to say, at least as far as the fourth epoch.

'It is very unlikely,' says M. de Quatrefages, 'that previous to our epoch man always lived alone, without any of those allies in which he has trusted from all antiquity. It is not more probable that his earliest companions perished completely at the time of the last great upheaval, while their master alone survived it. It is therefore very possible that some at least of our domestic animals are directly descended from species contemporary with the first men, and have their origin consequently in a geological period anterior to that in which we live.' (*Revue des Cours Scientifiques*, July 1868.)

It is understood, of course, that this same original stock may exist no longer, except in a fossil state. That of the dog, of the horse, of the ox, &c., are cases in point.

We are so accustomed to look to the East for the solution of similar problems to those under consideration, that we forget what lies near at hand, and may furnish a simpler explanation. We do not, however, deny that several species or varieties, very similar to our own domestic ones, may have to come to us from the East, and have formed half-breeds and different varieties by mingling with the breeds already existing in Europe. The Eastern origin of certain species now domesticated among us is open to no manner of doubt. Such are, for example, the peacock, a native of India, the common pheasant, brought from the banks of the Phasis after the expedition of the Argonauts; the cock perhaps, and the silkworm, cultivated in China for nearly three thousand years.

A few animals only come to us from Africa. The guinea fowl, the canary, and perhaps also the ferret, are instances. Others, lastly, have been imported from America at a comparatively recent epoch. These are the guinea pig, the turkey, the musk duck, improperly termed the Barbary duck, the Canada goose, and the cochineal from Nepal. To Europe belong, in our opinion, the dog, the cat, the horse, the ass, the pig, the ox, the goat, the sheep, the rabbit; among birds the pigeon, the common fowl,[1] the duck, the common goose, the swan, and among insects, the bee (*Apis mellifica*, Linnæus).

We must not conclude this chapter without referring to a fact of great importance lately revealed to us by palæontology. I mean the discovery of the remains of the horse, and even of several species or varieties of the horse (*Equus neogæus*, *major*, &c.) in the post-pliocene or quaternary beds of South Carolina, Buenos Ayres, Brazil,[2] Chili, &c. Now it is well known that, previous to the Conquest, horses were unknown in America, and that those of the conquerors inspired them with astonish-

[1] M. Piette says he found in the cave of Gourdan, of the palæolithic period, some bones of birds which he attributes to a variety of the domestic fowl.

[2] According to Lund the horses of the Brazilian caves are in every respect similar to our modern horses. See *Bibliothèque Universelle* of Geneva, Archives, vol. v. p. 37, 1859.

ment, not unmingled with fear. In the same districts were found bones of dogs, pigs, oxen, and sheep, which so closely resemble those of our modern breeds as to be mistaken for the latter. Had these also an Eastern origin, or must we suppose, with Professor Agassiz, that they belong to a special and completely independent centre of creation? Must we believe that these species, apparently identical with ours, lived simultaneously in the Old and New Continents at the beginning of the fourth epoch, but that they became extinct in America without having been domesticated there, while the domestication of these same species took place in Europe and Asia, and that they here survived their American brethren until our own day? Did the latter disappear from their country long before the time when we transported thither our breeds of dogs, horses, oxen, sheep, goats, pigs, &c., which have since multiplied almost to excess, and become so wonderfully modified? Or, finally, must we suppose, as the Abbé Brasseur de Bourbourg is inclined to believe, that the New World civilized the Old, especially Egypt and Libya, transporting thither its domestic animals, its industry, its hieroglyphic characters, and even its religion so deeply tinged with zoomorphism and anthropomorphism? So profound is still the obscurity, and so impenetrable are the veils which still envelop these questions, all important to the history of humanity.

IV. ORIGIN OF OUR CULTIVATED PLANTS.

It would be a great mistake to attribute a foreign or Eastern origin to all our plants at present under cultivation. Indeed, one of the most eminent botanists of modern times, Oswald Heer, declares it to be established beyond all dispute, that the plants which flourish to-day in the canton of Zurich in a wild state are the continuation of the diluvian flora. He holds the same opinion with regard to half the Alpine plants, those, that is to say, which grow upon the peaks of the Swiss mountains. The other half belong to types brought from Scandinavia by the immense erratic blocks which the diluvian glaciers

carried from the mountains of Germany to the Alps, then recently upheaved, and as far as the Vosges and the Jura.

As to the cultivated plants which, with those of the valleys and the Alpine species properly so called, form the three elements which constitute the modern Swiss flora, the following are Heer's words with respect to them :—'The ancestors of many of our modern cultivated vegetables were originally indigenous to our soil. The great revolutions which overwhelmed their country, and changed its configuration, drove them from it, and it was not until a later period that their descendants returned to it, themselves unchanged. They now seem to be foreigners amongst us, yet they are descended from the true natives, which thus show what great modification plants undergo.' (*Ann. Sc. Nat.* vol. iii. 1865, p. 183.)

We give some examples borrowed from the author of this remarkable work on antediluvian botany.

Our hazel is probably sprung from an allied species (*Corylus Mac-Quarrii*, Forb.) which flourished in the miocene period. The *Fagus deucalionis* (Unger), very common in Switzerland during the same epoch, but still unknown in Denmark and even in Normandy during the age of stone, is considered to be the primitive type of our modern beech. A plantain tree hardly to be distinguished from that of America ; a species of cyprus, and the liquid-ambar also grew formerly in the Helvetian forests. A walnut closely resembling ours, which disappeared from Switzerland after the formation of the tertiary miocene strata, was preserved in Persia and on the mountains of Asia by means of an allied species. At a later period it was reintroduced, first into Greece, then at Rome, in the time of the kings, and reappeared in the Alpine valleys.

M. Gaston de Laporta, well known by his valuable works on vegetable palæontology, also reports numerous examples which prove the possibility of deriving from indigenous antediluvian types a large number of cultivated vegetables, which are commonly supposed to be of exotic and comparatively recent origin. I need only mention a few instances.

I shall not dispute the story that Noah planted the vine in Judea; but it is certain that this plant is far more ancient than Noah, since to find its original stock we must go back to the oldest tertiary strata.

Our bay laurel (*Nerium Oleander*, Linnæus) dates through its ancestors (*Nerium Rohlii*) from the epoch of the formation of the upper chalk beds, and before attaining its present form it passed successively through those of the *N. Parisiense* (eocene beds of the Seine basin), of the *N. Sarthacense* (mean eocene sandstone of the Sarthe), of the *N. repertum* (upper eocene, gypsum of Aix), of the *N. Gaudryanum* (lower miocene), of the *N. Oleander pliocenicum* of Provence (lower pliocene); all of which forms differ but little from each other, and of which the last, *N. Oleander pliocenicum*) so closely resembles our modern bay laurel as to be specifically confounded with it.

Similar modifications have taken place in the palæocene stock (*Laurus Omalii*) of the noble or poet's laurel (*Laurus nobilis*), of which the successive stages, beginning with the most recent types, are as follows: the *L. Canariensis* of the lower pliocene strata of the Meximieux, a species which still exists in the Canary Isles; the *L. princeps* of the upper miocene beds; the *L. primigenia* of the gypsum of the upper eocene beds near Aix; the *L. Decaisneana* (mean eocene); lastly, the *L. Omalii*, the earliest form (palæocene).

Our European ivy (*Hedera helix*) also dates back beyond the tertiary epoch to the *H. primordialis* of the chalk beds, which, before producing our common ivy, has passed through the forms of *Hedera prisca* of Sézanne; *H. Philiberti* of the gypsum of Aix; *H. Kargii* of Œnigen; *H. acutelobata* of Dernbach; *H. Mac-Quarrii* of Greenland; *H. Strozzi* of Tuscany.

We must not forget to say that many vegetable types which now occupy the warm or temperate regions of Europe are sprung from Arctic types which were distributed all over the continent during the whole of the miocene period. Several *sequoia*, the liquidambars, the beech, the

lime, willows, alders, birches, elms, maples, ashes, and walnuts, &c., may be cited as examples.

It does not enter into the plan of this book to endeavour to determine the origin of all the plants now under cultivation, and to trace all their varieties. I have said enough to prove that this origin must be sought in a more distant time, and in a nearer place than it was formerly supposed, indeed than many still imagine.

CHAPTER IV.

NAVIGATION AND COMMERCE.

I. NAVIGATION.

His breast must have been bound with a triple circle of bronze, as Horace says, who first ventured to trust himself to the mercy of the waves on a tree trunk hollowed with the axe and with fire, or in a frail craft made of birch, bark, reeds, or the skin of sea-cows.

The canoe, formed of a single trunk, was the first type of the great three-masted ship and of the ironclad. Sometimes pointed at both ends, sometimes with sharp bows and square stern,[1] the canoes were doubtless used by the Danes of the age of stone to seek their food in the open sea, to which practice the numerous molluscs and sea-fish whose remains still lie in heaps on the shores of the Baltic bear witness. The inhabitants of the earliest Swiss lake dwellings used them for the same purpose.

Moreover, it is impossible to doubt that the first attempts at navigation date from the archæolithic age, when we find, buried twenty or thirty yards below the beds of rivers in Scotland, England, France, and Italy, canoes still containing the stone axe with which they were hollowed, and lying beside bones of men and of the *Elephas primigenius* or mammoth, with whom they were contemporary.

Some of these canoes, belonging to the age of polished stone, are of considerable dimensions. Such were, for example, those found at Robenhausen, Glasgow, Saint-

[1] In spite of their great antiquity the canoes of the Swiss lake dwellings resemble in every respect those of the islanders of the Pacific.

Valéry, in the Valley of the Somme, which were no less than ten to fifty feet long by two to four wide. They were all of oak, formed of a single trunk, and shaped outside and in with more or less skill. It is almost unnecessary to say that they were all propelled by oars and not by sails. The use of the latter was long unknown to European man as to the inhabitants of the New World, always excepting the ancient Peruvians.

Several canoes not less than twelve feet long by three wide have been dug up in the British Isles; they were furnished at both ends with a species of handle, which seems to indicate that they were carried like the bark canoes used by the inhabitants of the shores of the North American lakes.

The Phœnicians can, therefore, no longer be regarded as the earliest navigators in our seas, although they had touched the shores of Spain and settled in that country before the time of Homer. At a far more remote epoch men acquainted with at least the rudiments of navigation brought from Sardinia to Elba and the neighbouring Island of Pianosa, pieces of black obsidian rock, foreign to these islands, from which the inhabitants made knives as sharp as those of Mexico. The numerous flint implements found in the same islands were brought thither from the country since known as France.

It is easy to understand that with such craft long voyages undertaken for trading purposes were impossible. But it is perhaps a mistake to suppose that the sea formed an impassable barrier to these early navigators. Authenticated facts, quoted by trustworthy authors—Humboldt, Kane, and Wilson, for example—prove that this assertion is too sweeping. Thus the *kayak* of an Eskimo fisherman, who was found living on the shores of Scotland, is preserved in the museum at Aberdeen. Other Eskimos of Greenland and Labrador have been more than once carried by ocean currents from the New to the Old World. Lastly, Wilson cites the recent example of a Japanese junk which was shipwrecked in Oregon, and whose crew

was found captive among the Indians of the Hudson's Bay Territory ('Prehistoric Man,' p. 100).

Nothing, therefore, is opposed to the belief that our ancestors of the stone age were acquainted with a very simple form of navigation, dangerous and necessarily very limited in extent.

Even in our own day, however, the Clalam Indians of the Straits of Fuca hollow out of cedar trunks with their stone axes, canoes fifty feet long, capable of containing a crew of thirty men. With these canoes they brave the tempests of the Pacific, and venture even to harpoon the whale, which they prevent from diving by floats of seals' skins filled with air and attached to the harpoon by long cords. More simple canoes made from the stem of a palm tree are used by the Yucucari Indians in travelling with their children and goods. They put both into the canoe, and the husband and wife swimming one on either side, they thus make between thirty and forty miles a day. Our primitive barks may have served the same purpose, and may often have been propelled in like manner.

The inhabitants of those vast districts intersected by lakes and rivers, which extend from the Gulf of Saint Lawrence to the Pacific construct light and elegant boats from thin planks of cedar wood covered with birch-bark, which they carry from one lake to another just as a European traveller sometimes carries his portmanteau from one railway station to another.[1] Lastly, we know the *balsas* or rafts, which cannot sink, of the ancient Peruvians, constructed from beams of a light porous wood covered with a flooring of reeds. They were provided with two masts supporting a large woollen or cotton sail,

[1] The name *portage* is given to those parts of the mainland traversed by travellers when obliged to bear on their shoulders the canoe and its contents. Some of these barks, which are at least four yards long, weigh barely thirty pounds. Those called master canoes are longer and wider, and consequently heavier. 'The Egyptians of the time of Juvenal, and even those of our own day, launch on the Nile rafts made of earthenware vases bound together by cords, covered with canes, and moved along the current by oars. Arrived at their destination, they break the raft and sell the vessels at the bazaar.' (Wilson, *Prehistoric Man*, p. 98.)

with a tiller and a movable keel. Simpler *balsas* now used upon the Lake of Chiquito in Bolivia are merely formed of two thick bundles of reeds five or six yards long. They are propelled by means of a sail also made of plaited reeds, or by oars. The canoes naturally recall to mind the *coracles* of the ancient Britons, the *baydars* of the Aleutian Isles, and still more the *kayaks* in which the Eskimos brave the winds and waves in perfect safety.[1]

But what an immense distance separates the primitive canoes, the *coracles*, the *baydars*, the *kayaks*, and the *balsas*, from our sailing vessels, and above all from those formidable ships moved by steam with a power which modern science strengthens or moderates at will!

It was only by a strong reinforcement of men, by means of a treble rank of rowers, even in the time of Darius and Xerxes that the galleys cut their way through the waves of the Hellespont.

'Our ships of war,' says M. Michel Chevalier, 'are furnished with engines nominally of fourteen thousand horse-power; but as their possible force, only employed in case of necessity, is five times as great, they are really engines of seventy thousand horse-power. As the horse of steam is twice as strong as the animal of flesh and blood, and as the engine works night and day, whereas the hack or the plough horse can seldom go more than eight hours, a steam horse does the work of six of these animals, which we nevertheless consider such useful and convenient servants. Here, then, is a machine which alone represents four hundred and twenty thousand horses at work. With the exception of the unparalleled army which Napoleon led across the Niemen, *en route* for Moscow in the summer of 1812, I do not think there has ever been in modern times a single army containing so great a number of horses.'

[1] The *kayaks* are barks made of a light wooden framework, covered on the outside with the skins of seals filled with air, strongly sewn and wrapped closely round the waist of the single and almost amphibious occupant of the boat. The *baydars* are also canoes made of a single skin, or of several sewn together, and they are used by the inhabitants of the Aleutian Islands to cross the Pacific.

II. COMMERCE.

How far the commercial relations of the primitive people of Europe extended, and what routes they followed, is a question of which the solution, like that of so many others, is as yet merely guessed at. However, the presence of amber from the Baltic, and of white Mediterranean coral in Switzerland, Italy, and elsewhere; of carved flints in abundance in the Isle of Elba, where this rock does not exist in a natural state; arrows made of the black obsidian of Sardinia, found in the same island and in that of Pianosa; the jade axe found at Pauilhac, in the department of Gers; those of augite of Auvergne found in Brittany; the green turquoise of Brittany discovered in several dolmens in the south of France: all these articles, of which the rough material is foreign to the country where they are found, prove that from the earliest ages, more or less extended, commercial relations existed among the most ancient inhabitants of Europe. Indeed, there is nothing more natural than this exchange between two neighbouring tribes. The jade axes found in many parts of the European continent—at Concise and Meilen, for example—have even led to the belief that exchanges were made between this continent and the eastern regions of Asia, a trade which could only be carried on by means of long and dangerous voyages, hardly to be reconciled in our opinion with the infancy of navigation.

But before admitting this hypothesis, it is as well to be certain that these axes come from the East, and that they are made of Oriental jade. M. de Mortillet strongly maintains the contrary opinion. He thinks that this supposed Oriental jade is simply a serpentine stone, more or less impregnated with silica, and formerly rather common in the Swiss Alps and in the Apennines. The primitive Europeans could pass from hand to hand by means of exchange and by land journeys, or at least journeys along the great rivers, the axes of supposed Oriental jade really manufactured from some indigenous quartzo-serpentine rock.

Moreover, the researches of M. Damour[1] show that the most different matters have been classed together under the name of nephritus, such as agate, jasper, diorite, serpentine, petro-silica, &c., and generally all hard, tenacious, and dense rock, whose mineralogic nature was not well known. Perhaps this supposed Oriental jade comes into this category. M. de Quatrefages is among the number of those who think that these nephritus or jade axes, found in France and elsewhere, have been conveyed thither from Asia by means of barter. It is not absolutely impossible that this is the case, but there are no valid proofs in support of an opinion as little certain as the contrary one.

M. Nicolucci denies in so many words the assertions of M. G. de Mortillet. He said in 1871, speaking at the Prehistoric Congress of Bologna: 'Among the polished implements of the Neapolitan provinces, we possess several made of a greenish stone, known since the last studies of M. Damour as *jadeite*. This stone has not hitherto been found in Calabria, in the Apennines, nor in the Alps, while on the other hand it abounds in Central Asia, and could therefore only make its way into Italy by means of a prehistoric trade existing between Europe and Asia.' But if nephritus is of Eastern origin and indicates a continued trade with the East, why did not those who brought it into Europe import also bronze and iron, then in almost daily use among them? Chemistry, consulted in its turn, furnishes also its contingent of proofs. After subjecting the axes found at Concise, Meilen, and Mooseedorf to a series of analyses, and comparing the results with those obtained by M. Scherer from a study of the true Oriental jade, M. de Fellenburg adopts the opinion of M. Desor, and says that the hypothesis of the Eastern origin of the Swiss stone appears to him to be nearest the truth. But this solution, as the author of it owns himself, remains a pure hypothesis, since direct and conclusive proofs are wanting.

It is impossible to come to a decision among these

[1] *Comptes-rendus de l'Institut*, vol. lxi., p. 337.

conflicting and even completely contradictory opinions. M. de Mortillet's first view appears to me to be the most plausible one. But he now owns himself, in spite of his former contrary assertions, whose value he thereby singularly diminishes, that no veins of jade which might have served to make the axes in question have hitherto been found in Europe. Satisfactory proofs of the identity of the Oriental jade with that of the axes found in Europe, and of the absence of this stone in this continent, can alone settle the question. We should still, however, have to dispose of the difficulty of accounting for such extended commercial relations at a time of necessarily elementary navigation. The same difficulty does not exist with regard to the dissemination of the various kinds of shells used for adorning garments and for personal ornament, which are found in the caves, tombs, and dolmens. The shells bear witness to a trade far less extensive, and therefore possible among the primitive European populations. Thus, *Cyprea pyrum* and *C. lurida*, found at Laugerie Basse, indicate the existence of a trade by barter between the inhabitants of the banks of the Vézère and those of the shores of the Mediterranean, in the same way that the *Littorina littorea*, picked up at Cro-Magnon, and the shells of the *faluns* of Touraine, found in other caves, are proofs of commercial relations with the dwellers on the shores of the Atlantic.

Lastly, the flints of Grand Pressigny, found in Belgium, and the articles of green obsidian, collected in the valley of Vibrata by Nicolucci, lead us to conclude that there was a trade between France and the Low Countries, between Italy and Bohemia. But those who attribute extended commercial relations to the tribes of the stone age found their belief on mere conjecture contradicted by all the facts.

CHAPTER V.

THE FINE ARTS.

I. THE ARTS OF DESIGN IN THE CAVES.

In their excellent work upon the relics of Aquitaine ('Reliquiæ Aquitanicæ'), profane relics indeed, but perfectly authentic, MM. Lartet and Christy have described to us the carved or engraved articles which they collected from the bone caves of Périgord.[1]

Glancing at the illustrations contained in the work, and recalling to mind the originals collected together in the glass cases of the Exhibition of 1867, and those which were exposed in one of the rooms of the Trocadéro in 1878, the observer feels no small surprise at the comparative degree of perfection reached by the arts of design among a still savage people, living in caves and ignorant of the use of metals. We will look at some of these articles, of very doubtful value in the eyes of the vulgar, priceless to the man of science or of taste, and, above all, to the true artist.[2]

Here is first a slab of fossil ivory found in the cave of La Madelaine by MM. Lartet and Christy; upon it (fig. 128) the antediluvian artist has engraved a picture of the mammoth (*Elephas primigenius*), easily to be recognised by its wide protruding forehead, its small shaggy ears, its

[1] It must not, however, be forgotten that the first attempts at carving and engraving in bone were found in the caves of Aurignac, Savigné, and Massat.

[2] According to M. G. de Mortillet, a lover of antiquities offered in 1869 to buy for a million of francs (40,000*l.*) the contents of the case containing the fifty-one specimens relating to the history of art in the reindeer age.

Fig. 128. Mammoth elephant engraved upon ivory. (Cave of la Madelaine.)

long tusks with an upward curve; by the long hairs which cover its head and body, and, lastly by the heavy brown mane along its neck and back, and which seems to have resembled that of the bison. There can be no doubt that the engraver had seen the animal whose image he reproduced. His representation is even more accurate than that drawn after nature by a modern artist, a mere trader, certainly, of the elephant found in 1806, with its skin, flesh, and bones near the mouth of the Lena, on the Frozen Ocean. After comparing the two drawings reproduced together in the 'Bulletin of the Imperial Academy of St. Petersburg,' and after reading the accurate criticism on the latter by Professor Brandt, we are easily convinced of the superiority of the artist of the stone age over the contemporary Russian trader, at least as far as accuracy of morphological detail is concerned.[1]

To this portrait of the mammoth, produced by the graving tool of a reindeer hunter, we must add a second to which, found among his father's collection, M. Louis Lartet has lately drawn attention. The exact spot from which this curious specimen was taken is unknown, but all evidence tends to show that it came from Périgord. It represents the *Elephas primigenius*, engraved with a flint style by an artist who seems to have been impeded in his work by the movements of the animal before him. This appears to be the explanation of the several doubtful

[1] In a series of papers published in German by the Imperial Academy of St. Petersburg, vol. x. 1866, Professor Brandt has made a complete and instructive study of the mammoth, and gives a picture of it (p. 115), which he honestly owns is somewhat idealised. The tail in the drawing is too long, the mane does not extend far enough along the back, and the hairs are not sufficiently long, since they really hung as low as the knees of the animal; lastly, this mane was not black as in the picture, but reddish-brown. The hair upon the head was soft to the touch, reddish-brown also, and six feet in length. Besides these long outer hairs the mammoth was provided with a thick, curly woollen fleece. All these corrections made by Brandt were suggested to him by the documents he collected relating to the mammoth preserved at Moscow, or to the remains of the specimen found in 1864, not near the bay of Tas as was at first announced, but in the neighbourhood of the bay of Jenissei. Brandt also confidently drew information from the drawing of the unknown artist of the Dordogne.

lines made by the draughtsman before he clearly decided the outlines of his first drawing. This he soon abandoned, and traced two drawings, fairly accurate this time, of the colossal beast whose trunk is lowered towards the earth in the one, curved inwards towards the body in the other. Both are engraved upon the two surfaces of a piece of bone, polished on both sides, and they represent almost the entire profile outline of the animal.[1]

Another passably-executed drawing probably represents the glutton, a migrated animal, whose presence in

FIG. 129. FIGHT BETWEEN TWO REINDEER, ENGRAVED UPON A SCHISTOSE ROCK.

the caves of Périgord is a fact worthy of note. We come next to a schistose rock on which the draughtsman has represented a fight between two reindeer bucks (fig. 129). The one raises his head proudly to solicit the favour of the female as the prize of the victory which he has just won. 'This complicated composition,' says M. G. de Mortillet, 'rendered with a true feeling of the situation, is never-

[1] See in the *Matériaux* of 1874 a note by M. Louis Lartet, entitled *Gravures inédites de l'âge du renne paraissant représenter le mammouth et le glouton.*

theless executed with extreme *naïveté*. Each animal is drawn as though the others did not exist. Thus the fore legs of the conquered deer, which should be properly hidden by the body of the female, are distinctly represented notwithstanding.' The reindeer is the animal most frequently drawn or carved on the weapons or ornaments of the hunters of Périgord. The horse, in repose or galloping, is also often represented; but the picture is not always a success. The aurochs, the wild goat, the chamois, the stag, the ox, the fox, the hippopotamus, and the rhinoceros occur also on several sculptured bones. The *saïga* antelope, now confined to Tartary and the Ural Mountains, is likewise occasionally represented.

The Pyrenean caves also bring their contingent of materials for the history of primitive art; that of Bruniquel, whose inestimable riches now no longer belong to France, furnished M. Brun, the zealous director of the Natural History Museum of Montauban, with a piece of reindeer horn fashioned into the form of a wand of office. The hole for suspending it is pierced in part of the circumference. But whatever may have been the purpose for which this implement was intended, the figure of an animal is represented upon it; but unfortunately the drawing, inferior in execution to those of Périgord, is not sufficiently good to enable us to be certain what mammal it is intended to represent. We may also mention the drawing of a cave-bear, easily recognised by its protruding forehead, which Dr. Garrigou observed upon a pebble which he found in the lower cave of Massat ('Bulletin of the Geological Society of France, 1867,' p. 143).

This drawing, engraved in outline like that of the mammoth of the Madelaine, represents an animal of a long extinct species. The artist of Ariège, who drew this accurate portrait, therefore saw the living animal; he was contemporary with it, as the artist of Périgord was with the mammoth whose picture he has left us.

Lastly, M. Ed. Lartet observed the head of the modern Pyrenean bear very accurately drawn upon the extremity of a stag's antler, broken across at the joint where a hole

had been pierced in it. Firm hatched lines indicate the shadows; a distinct step in advance of the preceding figures, which were merely outlined.

Fig. 130. Reindeer of the cave of Thayngen. (After Prof. Mark.)

The cave of Duruthy, first inhabited in the reindeer age, and during its artistic period, was used as a place of burial at a time very near the neolithic age. More than thirty skeletons have been discovered in the upper and disturbed part of the cave. Beneath the hearth which lies below these graves, a human skull and bones were found in company with carved and engraved teeth of the lion and bear. One of the teeth bears on one side the image of a fish, and on the other, ornamental lines and a barbed arrow.

Here we again meet with the skill, the methods, and even the details of ornament of the primitive artists of Périgord. The engravings, executed by Basque or Béarnese artists, nevertheless bear their distinctive marks, and the barbed arrows serve them for a signature. Instead of being drawn upon reindeer bones, as

at Aurignac, the figures are cut upon bears' teeth. Barbed arrows, symmetrically disposed, and furnished with a varying number of barbs, which constitute their principal ornament, have not, to my knowledge, hitherto been observed upon the figured articles of Périgord and the Pyrenees.[1]

The artists who engraved these drawings were bear hunters, as at Aurignac, and not reindeer hunters. The seal engraved upon a bear's tooth seems to show that one of these artists, before settling in the neighbourhood of Gave, had dwelt upon or had visited the sea-coast, for he had certainly seen seals.

Sculpture itself has a very remote origin; it was born along with the arts of design proper, in the age of carved flint instruments; for to fashion rude matter into an instrument of daily use is as truly sculpture as the carving of a priceless work of art.

Switzerland, as well as France, can boast of antediluvian artists, some of whom give proofs of great skill. Such, for example, was the man who drew with a flint style upon a piece of reindeer horn the picture of a reindeer grazing, which was certainly under his eyes (fig. 130). M. Hain has justly called attention to the accuracy and even the boldness of this prehistoric drawing. It is evident, he says, that this was not the artist's first attempt, and his work will bear comparison with that of his rivals of Languedoc and Périgord. Professor Hain, however, is of opinion that the head of the animal is too large and the ears too small. He is inclined to think that these two peculiarities are due to the poverty of the pasturage in the districts inhabited by the animal, and, indeed, the theory of the learned professor of Zurich is further confirmed by the hollow belly of the poor brute, which shows that the cravings of its appetite were not always satisfied, &c.

This remarkable specimen found in the cave of Thayn-

[1] Louis Lartet and Chatelain Dupare, *Une sépulture des ancien troglodytes des Pyrénées, superposée à un foyer contenant des débri humains associés à des dents sculptées de lion et d'ours.* Paris, 1864.

gen, near Schaffhausen, proves two facts; first, the certainty of the long-disputed existence of the reindeer in Switzerland in prehistoric times; secondly, the flourishing condition of the arts of design in the same country and at the same epoch. Besides the representation of the reindeer found in the cave of Kesslerloch, a number of not less successful drawings and carvings were likewise discovered there, proving that these Swiss artists were possessed of a talent in no way inferior to that of the reindeer hunters of Périgord and the Pyrenees. Among the carvings we will only cite a head of a horse, and a head of the *ovibos* (fig. 131), impossible to be mistaken, and among the engravings on bone, the horse (fig. 132), the pig, the bear, and the fox, whose form and attitudes are given with a

FIG. 131. HEAD OF OVIBOS MOSCHATUS FROM THE CAVE OF THAYNGEN.

fidelity which leaves little to be desired.[1] Yet the inhabitants of the cave of Kesslerloch lived at a far earlier period than that in which the lake cities were built, and no trace of pottery or of tissues have been found among them. Domestic animals, including the dog, are also entirely absent.

It is a remarkable fact that the bone caves of England are completely destitute of any specimens of drawing or carving, although fish-hooks, pins, and even needles skilfully wrought in bone have been found in several of those of the reindeer age. The same artistic inferiority exists among the Belgian troglodytes, without even excepting those of the cave of Chaleux, emphatically styled a little

[1] See in the *Matériaux*, vol. xi. 1876, p. 102, and the following figures, 40, 43, 53, 54, 55, 56, 57, and 58, of which we here reproduce the most important.

quat[illegible]ary Pompeii. It is to them, however, that we ow[illegible]one of the most ancient specimens of the plastic art. [illegible]is is a small wooden figure,[1] very rudely carved, a sort

FIG. 132. HORSE ENGRAVED IN OUTLINE UPON REINDEER HORN. (Wand of office.)

of rough sketch, which denotes the infancy of art, and

[1] A drawing engraved upon reindeer horn, but hard to decipher, was found with this specimen at Pont-à-Lesse.

which dates from its very earliest dawn, since the stratum where it was found is one of the upper layers of the mammoth.[1]

I am only acquainted with one specimen of Scandinavian art in prehistoric time, a drawing representing a doe, engraved with a flint style upon a carved piece of stag's horn.[2]

It is yet an open question whether the strange carvings of ships with their crews, which are to be seen on the rocks of Sweden and Norway, should be attributed to the neolithic period or to the age of bronze. M. G. Brunius, who has given special attention to this subject, is of the former opinion, while others, on the other hand, deny them any antiquity.

FIG. 133. FIGURE OF A NAKED MAN BETWEEN TWO HORSES' HEADS. (After Ed. Lartet and Christy.)

It is a singular fact that while these prehistoric artists render with delightful simplicity, and at the same time with perfect truth, the natural scenes they had before their eyes, such as a reindeer fight or the chase of the aurochs; while they represented in outline, with a skill unattainable by those of us who have not learnt to draw, the figure of the animals which lived at that remote epoch, they are embarrassed, constrained, and unskilful in their efforts to reproduce the human form. These primitive drawings resemble those of the pretended 'Book of the Savages,' which really are the work of clever scholars, destined perhaps to become great masters at some future time.

[1] The fossil fauna of this stratum belongs to the transition period between the ages of the mammoth and reindeer.

[2] Nilsson's *Primitive Inhabitants of Scandinavia*, plate xv. figs. 258 and 259.

MM. Ed. Lartet and Christy discovered at the cave of La Madelaine, upon a wand of office, the first representation of the human form, drawn in outline between two horses' heads, and a fish apparently nearly allied to the eels (fig. 133). But in this sketch the face is without expression, and the limbs, although fairly distinct, remain unfinished, the artist having omitted the feet and hands. An arm and hand, perhaps tattooed, at any rate marked with oblique zigzag lines and possessed only of four fingers, the thumb being omitted, is traced upon both sides of a spear-head found in the same place as the above-mentioned drawing ('Reliquiæ Aquitanicæ,' pl. ii. fig. 86, pl. xviii. figs. 1 and 10). It was also in Laugerie Basse that M. Elie Massénat discovered two antediluvian engravings, the one representing the head of an elephant, the other an aurochs hunt, in which the animal is represented fleeing before a man who appears to be throwing darts. According to M. Massénat, 'it is the finest and most perfect drawing of the human form of the epoch of the caves that has been hitherto discovered,' without even admitting an exception in favour of the fisherman armed with the barbed harpoon, with which M. Broca made us acquainted in his remarkable lecture at Bordeaux in 1872.

We give M. Massénat's description of this specimen:—

'The figure is nude. . . . The form of the head is brachycephalous; the hair stiff and growing in tufts on the top of the head; the chin is furnished with a very apparent beard; the neck rather long; the upper arm comparatively short; the hands badly drawn; the right arm thrown backwards seems to be about to lance the javelin with which it is armed, while the left is stretched forward as if to seize the aurochs by the tail. The chest is protruding; the belly well drawn; the sexual parts large and strongly developed; the vertebral column rather long and resembling in its arched form that of the ape when walking upright; the thighs are well drawn, but the femur is very short; the lower part of the leg and the

foot are regular and well formed; the head is slightly thrown backwards, and the face has a joyful expression which attracts notice at the first glance.' ('Matériaux,' 1869, p. 333).

Lastly, at Laugerie Basse the Abbé Landesque found

FIG. 134. FRAGMENT OF A SCAPULA, FOUND AT LAUGERIE BASSE, ON WHICH IS ENGRAVED THE FIGURE OF A PREGNANT WOMAN.

the fragment of a scapula on which the artist had engraved in outline the body of a woman apparently in an advanced stage of pregnancy (fig. 134). This woman wears bracelets, and her throat is adorned with a necklace of large beads. On the same piece of bone may be seen the two hind legs of

a reindeer, of which the rest of the body has disappeared with the piece broken off.

The reader may have seen in the glass cases of the gallery devoted to anthropology in the Exhibition some rude drawings found by M. Rivière on the rocks of the Val d'Enfer, not far from the Lake of Wonders. These drawings are said to bear a close resemblance to those which the Guanchos, the ancient inhabitants of the Canary Isles, engraved upon the rocks there before the formation of the Straits of Gibraltar, when Africa was still united to Spain and to the Canary Isles, from which it is not now far distant. At this same epoch, it is further said, the Guanchos may have occupied, indeed occupied in point of fact, the south-west of Europe, as their skulls have precisely the same characteristics as those of Cro-Magnon, and as a close resemblance exists between their ornaments and those found at the last-named spot; hence it is supposed that the drawings of the Val d'Enfer were engraved by the Guanchos. These conclusions appear to me to be somewhat rashly drawn, especially if, as some archæologists now suspect, the skulls of Cro-Magnon are more recent than it was originally believed. This would completely dispose of their pretended identity with the primitive inhabitants of the Canaries.

More authentic and far more perfect drawings also figure in the collections of the Colony of the Cape of Good Hope. These drawings, representing both the men and animals of the country, are, at least as far as the modelling and attitude of the human form is concerned, far superior to those of the caves of Périgord, which leads us to think that they are of more recent date. But they are notwithstanding very remarkable, inasmuch as they are the products of the pictorial art of the Bosjesmen, one of the lowest of human races.

We have seen that the human form, in its primitive nudity, is represented in outline on the reindeer bones discovered in the caves of Périgord, by the artist who lived in this district at a period to which it is impossible

to assign a date, but which was certainly very remote. We are now to see the same human form represented in relief by these same unknown artists, in whom we ought perhaps to recognise our first ancestors.

Antediluvian statuary presents, in fact, to our somewhat scandalised vision a species of immodest Venus, found in Laugerie Basse by M. de Vibraye. 'This,' says M. de Mortillet, 'is a tall, thin female body, of which the reproductive members are strongly developed and the buttocks extremely prominent. The head and legs are wanting, having been long since broken off. The arms never existed.' The Abbé Landesque also discovered in Laugerie Basse a small figure, rudely carved in reindeer horn, in which, with the help of a little imagination, may be distinguished a naked human being, crouching in a suppliant position ('Matériaux, 1874,' p. 276).

Among other precious treasures, Laugerie Basse has also furnished M. de Vibraye with a mammoth's head skilfully carved upon a wand of office, which is unfortunately broken, and of which the lost half probably represented the body of the animal. The mammoth has also been represented in relief, but very roughly, on a fragment of reindeer horn found at Montastruc by M. Peccadeau de L'Isle, to whom we are also indebted for the discovery of the handles of two daggers, on which the artist had figured the reindeer from the horn of which these remarkable specimens were carved. In their 'Reliquiæ Aquitanicæ,' MM. Ed. Lartet and Christy have likewise given an illustration of the carved handle of a dagger, which represents a reindeer with its muzzle raised so that the antlers lie along the shoulders, while the fore feet, bent back under the belly, form the handle. The hind legs stretched out towards the blade connect it with the handle of the dagger (fig. 135). Although this carving is merely indicated, it is notwithstanding the work of an artist, proved worthy of the name by the skill he has shown in adapting the position of the animal to the necessities of his plan without rendering it forced.

Man and mammalia have furnished the carvers or

draughtsmen of the reindeer age with their most numerous subjects of composition. Yet they have sometimes represented birds (the blackcock, the swan, and the goose); reptiles (snakes); batrachians (tadpoles of frogs); and fish (eel, carp, barbel, and trout). It seems that, owing to their usually small size, the invertebrate animals did not attract the attention of the troglodyte artists, for no representation, either drawn or carved, has hitherto been found of any one of them.

Plants even, in spite of the size and stately appearance of some of them, and the grace and beauty of the foliage and flowers of others, are likewise very rarely represented in drawing, never, as far I know, in sculpture. Three flowers only were shown in the Exhibition of 1867. A

FIG. 135. CARVED REINDEER-HORN HANDLE. (After Ed. Lartet and Christy.)

frond of fern engraved upon a staff of office, found in the station of Mont Salève by MM. Favre and Thioly, has been lately added to the number. Lastly, M. Cazalis de Fondouce saw at La Salpêtrière, in the department of Gard, the drawing of a pine (*Abies excelsior* of Linnæus) scratched with a flint style upon an antler of *Cervus tarandus*. We may mention, by the way, that this fact, in conjunction with others observed by the same author, proves that man hunted the reindeer in Lower Languedoc, on the borders of Provence, and only a few leagues from the Mediterranean.

It was formerly believed that the arts of design completely disappeared in France during the neolithic period. This was a mistake. In the caves which he discovered in Champagne, and which belong to this period, M. de Baye

found traces of sculpture; but, far from showing any progress, the art appears to be decaying. It is worthy of mention, nevertheless, that a rudely-carved figure may be seen in one of the artificial caves hollowed out of the chalk with an axe of polished flint. The nose is of exaggerated size, the eyes are indicated by two holes filled with a black substance, the face resembles a bird. A necklace lies upon the breast of the figure, and the locket which hangs from the middle of it is painted yellow, probably with hydrated iron diluted in water. The breasts, which are very prominent, have been modelled in an unnatural position by the sculptor of Champagne, evidently little versed in the science of anatomy. As to the rest of the body, neither the arms nor the legs are distinctly modelled. This same form, which is repeated upon the walls of several caves, perhaps represents a god in human form, a female divinity, as M. de Baye thinks. If this were the case, it would furnish a hint as to the religious ideas, even as to the mode of worship of these ancient tribes of Champagne. We shall recur to this subject presently.[1]

In spite of their obvious imperfections, these drawings and carvings of our primitive ancestors are, notwithstanding, without the stiffness of those of the Egyptians of the earlier dynasties.

The race to which the artists of the Vézère belonged is considered by MM. Quatrefages and Hamy to be a type to which they have given the name of Cro-Magnon, and they regard the Guanchos of the Canary Isles, and certain Kabyles of the Beni Masser and of the Djurjura as the best preserved representatives of this ancient race, endowed with such a remarkable gift for the arts of design. In France they regard the modern Basques of Zaraus as their descendants, as also the Parisians of the

[1] We are involuntarily struck with the resemblance between the statuettes of the Marne with the im e of Minerva with the owl's eyes (γλαυκῶπις Ἀθήνη) and prominent breasts, represented on a great number of the earthenware vessels taken by Dr. Schliemann from the ruins of Troy.

fifth century, and even certain Parisian women of modern times.

II. PAINTING AND MUSIC.

There is nothing to show that the men of the reindeer age cultivated painting to the same extent as drawing, properly so called. They were nevertheless acquainted with certain colouring matters; it appears even that they painted their bodies with a mixture of grease and red hæmatite or oxide of manganese, a custom practised later by the Picts of Great Britain, and in modern times by the savage tribes of America, by whom similar colouring matters are frequently employed for this purpose.

Hæmatite, or red chalk, reduced to powder and perfectly preserved in a *cardium* shell, was discovered at Bruniquel, by M. Brun, director of the Natural History Museum of Montauban. Lying beside this colouring matter was a bone implement which may have been used for tattooing, the most favourite species of ornamentation among modern savage tribes. Pulverised hæmatite was also found at Montastruc by M. Peccadeau de L'Isle, in Dordogne by MM. Lartet and Christy, in Belgium by M. Ed. Dupont. Lastly, M. Cazalis de Fondouce found in a cave on the banks of the Gardon, that of the Salpêtrière, belonging to the reindeer age, a sea-shell full of hæmatite. Close to the shell lay the mortar which had been used to grind the colouring matter to a fine powder, and to mix it with grease, so as to make a pomatum destined to colour the body red, and to protect the skin against atmospherical influences ('L'Homme du Gardon,' p. 44, Paris, 1872).

We hesitate to name whistles among musical instruments, because of their piercing and usually disagreeable sound. But because of this very shrillness the notes of the whistle may have been used as a call by the hunters.

It is certain that in the caves of Périgord and elsewhere several instruments have been discovered made from the phalanges of the reindeer, with a hole pierced in them, which are true whistles, and will still give forth more or less sound. Moreover, M. Piette has lately found,

in the caves of the Pyrenees, tubes made of the bones of birds, which once he thinks formed part of a flute like that which tradition attributes to the god Pan, which consisted of several reeds of unequal length, bound together by cords, or slips of wood placed cross-wise. Other tubes, like those of the Pyrenees found at Laugerie Basse by the Abbé Landesque, and at Rochebertier, in Charente, by M. Fermond, seem to corroborate M. Piette's theory. The invention of compound flutes, if these really merit the name, dates therefore from the reindeer age.

III. POTTERY.

The print of a horse's hoof in the wet earth, a piece of clay hardened among the cinders on the hearth, or merely dried in the rays of the sun, may have suggested the idea of employing earth to make vessels for holding water, fruits, or any kind of provision. This idea, however natural, yet appears to have occurred to the mind of our prehistoric ancestors at a comparatively late epoch. Flint carving had long been practised; the wooden vessel was probably invented; the horns of the *Bos primigenius* or of the aurochs were doubtless already used as drinking cups by primitive man, when first he thought of using wet clay, kneaded by his hands, to create a new manufacture. This manufacture became one of the most useful, and developed into an art whose productions, perfected and beautified by science, furnishes models to many others, and rival in beauty of form, wealth of ornament, and brilliancy of colour, the most valued works of sculpture, painting, and architecture.

A number of natural objects may have originally taken the place of pottery, and are even now used in its stead. Such are certain vegetable forms—cocoa-nuts, the spathes of palm trees, the stems of the bamboo; such are also the horns and hoofs of cattle, the skulls of man, and other animals. The modern inhabitants of Madagascar use the eggs of the *Æpyornis maximus* for saucepans.

According to Tylor, the wooden vessel, or the basket of cane or osier, was properly speaking the first foundation

of the keramic[1] or potter's art. Covered either inside or out with a layer of clay, for the better protection of the vessel or its contents, then purposely consumed, or burned by accident, the destruction of the wood left intact the covering of clay. From this process to that of making vases of clay used alone and hardened by fire, there is but one step: the step was made, and the potter's art was born. The method indicated by Tylor appears to have been employed from time immemorial by the savages of America.

Modelling in clay, according to M. Alexandre Brongniart, dates from the very earliest times. It was first applied to fruits, which in decaying left intact the clay moulded round them. The modern Fiji Islanders still mould their earthenware vases round fruits with a more or less firm rind. Undoubted traces of this process are found in gourd-shaped earthen vases, which still contain remains of the rind of this fruit, and which are common in the ancient tumuli of the Ohio river. These same American tombs contain also fragments of pottery bearing the imprint of bags of coarse tissue or plaited bark, in which they had been cast or moulded, and the weft of which was faithfully reproduced on their outer surface. A basket destined to contain liquids was even found in a Peruvian tomb, and which, at the time of its discovery, was still capable of being employed for that purpose. Lastly, baskets of plaited straw are used by the modern Chinocks to contain the water in which they cook, by means of red-hot stones, the salmon which forms their staple food.

Clay naturally attracted attention by its plasticity, by the ease with which it retains the forms into which it is moulded, lending itself to any kind of ornament. Another precious property is the power of becoming

[1] The etymology of the word keramic is sufficiently curious to deserve a passing mention. The Greek word *κέρας*, whence *keramic*, originally meant the horns of animals used for drinking-cups; the word signifies not, therefore, the substance used in making them, but the original shape and nature of drinking-cups.

almost as hard as stone, especially when exposed to the action of fire, in spite of its great plasticity, a property to which we owe the important records furnished by this substance to the history of art and of civilisation. Therefore M. Brongniart does not exaggerate when he says, 'Pottery, as it became more abundant, was the source of benefits in times of obscurity, similar to those rendered by printing in more enlightened ages.' Considered from that point of view which specially concerns us here, pottery is, at least in a great number of cases, 'the geognostic equivalent of human remains' (de Christol), provided always that the beds in which the vessels occur are accurately known, and present no trace of any disturbance more recent than the time of burial of the objects in question.

Undoubted traces of productions of the keramic art were discovered at Cagliari, in Sicily, in a post-pleiocene stratum containing remains of extinct animals, and having evidently formed part of the bottom of some ancient sea, although now situated nearly 300 feet above the level of the Mediterranean. Homer asserts that he discovered in the sediment of the Nile, at a great depth below the surface of the soil, some earthenware and bricks, to which he assigns an age of twelve or thirteen centuries. M. Raynaud, a mining engineer, mentions fragments of pottery found in company with river shells buried in a deposit of calcareous sand, which covers the granite hills of the Isle of Bréhat, separated from the coast of Brittany, which is also granite, by a channel rather more than 2,000 yards in width. Now this fluviatile deposit must clearly have been formed at an epoch previous to the opening of the channel between the island and the mainland, that is, at an epoch when man had already betrayed his existence in these regions by the products of keramic art. Rude pottery also occurs, but rarely, in the earliest caves; those of Nabrigas (Lozère), of Aurignac (Haute-Garonne), of l'Herm (Ariège), of Bize (Hérault), of Souvignargues (Gard), of Rochebertier (Charente), of Chiampo and Luglio, near Vicenza.

M. Ed. Dupont has collected fragments from all the Belgian stations, which he has examined with the greatest care. M. Roujou discovered rough-hewn flints and some almost shapeless pottery in the yellow sediment of the Seine, near Choisy-le-Roi, a deposit which he believes to be anterior to the age of polished stone ('Congress of Bologna,' 1871, p. 83). Very rude earthenware has also been found in the cave of Hohefels, near Ulm, with a quantity of bones of the reindeer, bear, and mammoth. Lastly, the Abbé Spano considers that the fragments of pottery which he found in the neighbourhood of the most ancient Nuraghi, belong to the archæolithic age. (See p. 127.) But doubts have been thrown upon the contemporaneity of some of these keramic productions with the bones of extinct animals in the midst of which they were discovered.[1] Pottery becomes somewhat less rare in the reindeer age; it is common in the neolithic period.

M.M. Cartailhac and de Fondouce have even asserted that all the pottery found in the caves and in a number of dolmens belongs exclusively to the age of polished stone. They make no exception in favour of the curious fragments found in the cave of Nabrigas, of whose great age MM. Ed. Lartet and Christy had so little doubt that the latter had casts made of them for the English museums.[2] M. de Quatrefages agrees with us in rejecting the opinion of MM. Cartailhac and

[1] Among others by MM. de Mortillet and Cartailhac, who do not believe that pottery existed in the palæolithic age. M. Hamy is a partisan of the contrary opinion, which we are also inclined to share. Lastly, M. Flouest found in the camp of Chassey, in the department of Saône-et-Loire, a fragment of rude pottery, of which the inner lining, black in colour and almost friable, contains particles of silica which serve to bind it. The author of this discovery thinks he has reason to attribute this pottery to the earliest stone age.

[2] A specimen of this casting has been placed in the Natural History Museum of Toulouse. The original, in my possession, forms the bottom of a flat-bottomed vessel, irregularly circular, evidently hand-made, as the print of the fingers which moulded the clay and ornamented the outer surfaces with deep parallel furrows, is clearly distinguishable both outside and in. This fragment was found in an ossiferous sediment containing a quantity of bones of the *Ursus spelæus*.

de Fondouce, especially with regard to the prehistoric pottery of Belgium, notably that of the *trou du frontal*. 'It would,' he says, 'be placing the age of polished stone far too early to attribute it to an epoch when the chamois, the wild goat, and the *saïga* antelope lived in Belgium

FIGS. 136, 137, 138, 139. PIECES OF POTTERY FOUND IN THE BARROW OF WEST KENNET. (After Lubbock.)

with the Norway rat and the ptarmigan. This is perhaps a subject for consideration; but the presence of these species in the neighbourhood of Dinant is to us a proof that we are still in the fourth epoch' (De Quatrefages' 'L'Espèce Humaine,' p. 253, Paris, 1877).

The most ancient vessels, nearly always reduced to mere fragments, and even those of a more recent epoch, are made of coarse clay mixed with sand, with carbonate of lime, quartz, or mica,[1] imperfectly baked with fire or sun-dried, but not thrown on the wheel, an invention of comparatively recent date. Yet these vases are often elegant in shape, of which the reader may readily assure himself by glancing at the vessels discovered more or less intact in certain tumuli, and in the earliest lake dwellings of Switzerland and Italy. (See above, figs. 52 and 53.)

They are ornamented in the simplest and most uniform way, with designs in relief or depressions made with the nail or the top of the finger, with pieces of wood, pointed bones, or string pressed more or less deeply into the soft clay. On the more recent vessels these are in the form of straight or zigzag lines, dots, or parallel lines, squares, triangles, or rarely circles (figs. 136, 137, 138, 139). These combinations recall to mind the figures carved or engraved by the modern Kabyles on the blade or wooden sheath of their yataghans. Ornaments of twisted clay applied with the hand, occasionally handles, and sometimes, near the brim, knobs pierced with holes for the passage of a suspending string, never a spout; such are the distinguishing features of the pottery of prehistoric time.

Neither plants nor animals are ever represented on any of the vessels found in France, to whatever epoch they may belong.[2] This absence of ornament is one of the characteristics of primitive pottery. Yet from the reindeer age—that is to say, the epoch of the dawn of keramic art—the arts of design were already sufficiently

[1] MM. G. de Mortillet and Ed. Dupont assert that the pottery of the neolithic age only contains carbonate of lime mixed with the clay; while in those of the archæolithic age sand, mica, and carbonate of lime are all found. I do not know that large pieces of mica have hitherto been found in European pottery, as in American earthenware of the epoch of the mound builders.

[2] The stem and veins of a leaf are figured upon a vase found at Wangen, in Switzerland.

developed; we see the proof in the drawings and carvings executed on bone, ivory, and stone by the artists of Languedoc and Périgord. This presents a new problem to be resolved; unfortunately all the elements necessary to its solution are not yet forthcoming.

It is worthy of note that the instinct of imitation, so little developed among the primitive European potters, is on the contrary very strong among the various peoples of the New World. Their earliest vessels are a more or less faithful reproduction of the form of the fruits (that of the gourd is of most common occurrence), and of the animals of the country (see p. 165). The modern pottery of certain American tribes has retained the same character in spite of contact with Europeans.

A great similarity is observed in the pottery of the archæolithic and neolithic ages. This likeness is sometimes so great as to occasion a real difficulty in deciding to which epoch any given vessel should be attributed. Hence the numerous errors which have been made on this point, and which are still of daily occurrence. It cannot be denied, however, that vases with a curved bottom are more ancient than flat-bottomed ones. The latter mark a real progress in keramic art. Others, still more recent, terminate in a point, and require, in order to maintain an upright position, a clay ring or support which is frequently found with them. But this conical form is proper to the age of bronze, and therefore does not concern us here.

The potter's wheel, known in China from all time, is clearly represented on the wall paintings of Thebes and on the walls of the tomb of Beni-Assan, of which the date is nineteen or twenty centuries before Christ. But it was only generally employed in Europe at a much later date.

An observation which applies to almost all the products of primitive industry has been made upon the subject of pottery; it is that the vessels resemble each other the more closely among all peoples in proportion as the degree of civilisation attained has been less advanced. They differ, on the other hand, more and more widely in form,

ornamentation, and finish of workmanship, as soon as the artistic and intellectual culture of these same peoples attains a superior stage of development, and the individual genius of each of them, released from the fetters of instinctive imitation, can freely follow its peculiar bent.

The most ancient pottery, like that of our own day, was employed for the most various purposes. Drinking cups, cooking vessels of cylindrical or very expanded shapes, offering a large surface to the action of the heat, provision vessels, amphoræ, vessels for draining the whey from cheese, almost identical with those now employed for the same purpose in the south of France; lamps, sometimes taken for vessels for containing cream; funeral urns even—nothing is wanting to the pottery of those remote times if it be not the foolish luxury and the wasteful uselessness of these days. It is even rare to see prehistoric pottery covered with any species of glaze, even with that black glaze obtained so easily from graphite and sea salt.

CHAPTER VI.

LANGUAGE AND WRITING.

I. THE ORIGIN OF SPEECH.

HAD primitive man an articulate language or no? Had he at least the power of creating it? It is, in my opinion, an error to assert that primitive man was destitute of speech, as Russell Wallace maintains (*Pithecanthropus alalus*), and as certain Darwinists still think.[1] 'Language must have appeared on earth simultaneously with man,' as M. Emile Burnouf admirably says, 'and it was not preceded by a long silence; for the cause which produced this silence would have prevented it from being broken, and nothing short of a miracle could have put an end to it.' Now, as we have more than once said, we put no faith in such miracles; but we believe in the admirable laws which modern science has revealed to us, and which preside at the birth and organisation of languages as at those of societies. We believe that languages themselves are organisms which have their life in embryo, their infancy, their ripe age, their changes, their distant and repeated migrations, their decadence and death. We are firmly convinced that speech is a natural attribute of our intellectual being, a faculty inherent in our nature, a necessity at once psychological and physiological. We speak, not

[1] From the fact that microcephalous human beings do not speak, Carl Vogt concludes that they present an instance of atavism, a return towards the Simian stock whence the entire human race is sprung. Microcephaly is an abnormal phenomenon which may be rudely explained by the theory of arrested development, without the necessity of seeking to account for it by atavism, still less by a return to the supposed Simio-human type.

merely because we possess all the organs adapted to the emission of articulate sounds, but still more, and principally, because we feel the need of speaking. We see a proof of this in the child who talks to her dolls, the boy to his tin soldiers in battle array, the mother to her new-born child. The need of communication with our fellow-creatures is so important an element in the origin of language, that the child brought up in complete solitude remains dumb. The savage of Aveyron was an instance of this fact.

We speak as the nightingale sings in the spring, as the horse neighs, with this difference, that their language is purely instinctive, and can be transmitted by physiological heredity, while ours is partly the product of instinct, but still more that of our intelligence, and is only transmitted by the teaching imparted by one generation to the next.[1] In a word, as Sir John Lubbock justly observes, 'Languages are human in the sense that they are the work of man; divine in the sense that man in creating them made use of a faculty with which Providence had endowed him.' Another profound and essential difference is that the natural language of animals is only understood, with few exceptions, by the single species to which they belong. We, on our part, are possessed of universal languages—music, painting, sculpture, for instance. Besides, our languages are almost infinite in variety and complexity (the Basque and American tongues, &c.[2]), six hundred dialects

[1] The learned works of Darwin, Taine, Perez, &c., tend to show that the origin and development of language should be studied in the child and not in the adult man.

[2] Carl Vogt's theory is well known. It explains the differences in languages by the forms of the skull, and consequently of the brain itself. Abstract terms, the fruit of a great reflective power, belong to those races with an upright forehead, which indicates a considerable development in the anterior cerebral lobes. The idioms of races with a rounded occiput, which indicates a great development of the cervicle, an organ which regulates the movements, are distinguished by their variety of intonation and richness in concrete terms. The idea of the learned Swiss naturalist is certainly original; its truth remains to be proved, and I, for my part, much doubt whether the Greek language has a greater variety of intonation than the Hottentot. The cervicle has been endowed by physiologists with so many attributes

are reckoned in Europe alone, more than 1,200 in America (Wilson), and we are far from being acquainted with all the idioms of Asia, Africa, and Polynesia. Lastly, the same language undergoes infinite modifications according to time and place. The song of the Thracian nightingales, although somewhat improved, says the legend, by the lyre of Orpheus, was probably similar in every respect to that of the nightingale of our thickets. The language of Marot, on the other hand, is not that of Ronsard, still less that of Lamartine.

Besides cries, modulations of the voice (song without articulate words), gestures, motions, and attitudes of the body, prosopose (movement of the facial muscles), which express our emotions, our desires, our passions, our ideas, we have in addition to these forms of expression, which we possess in common with animals, the laugh, expressive of joy,[1] the unspoken yet moving language of the fine arts, music, painting, sculpture, and architecture. We speak by means of stone, marble, bronze, colours, musical sounds; of hieroglyphics, writing, ribbons (the *quipus* of Peru), flowers, cyphers, algebraical signs, and even by means of electric wires, which bear our thoughts in an instant of time across the solitude of the desert and vast expanse of the ocean. Lately we have learnt to do yet more; we can send our words to a distance, no longer by representing them to the sight by alphabetic or other conventional signs, but with all the intonations of the voice, its variations, tenderness, and whisperings. Yet further, a new wonder of science enables us to reproduce at will, not only the sounds of our own voice, but also those of the voice of others. What anthropomorphic ape ever conceived the idea of such inventions?

While recognising that articulate language is a special faculty of man, Darwin believes it not impossible

that it seems hardly necessary to give it yet another which is anything but proved.

[1] If a Simian ancestor has really transmitted to us the germ of the faculties which we now possess, how could he endow us with that which he had not himself—the laugh, articulate language, the gift for the fine arts, &c.?

that it may have been transmitted to him by a Simian ancestor. But he gives very insufficient proof in support of so bold an assertion. 'Monkeys,' he says, 'certainly understand much of what is said to them by man, and as in a natural condition they are able to utter cries to warn their companions of danger, it does not appear to me incredible that some more sagacious ape may have conceived the idea of imitating the howling of a wild beast in order to warn his fellows of the species of danger which threatened them. A fact of this kind would indicate the first step towards the formation of a language' ('Descent of Man,' p. 59). This is all very well, but what has become of this ancestor, our clever *precursor*, and why does no anthropomorphic ape of our own day still make use of an articulate language?

II. SUPPOSED CHARACTERISTICS OF PRIMITIVE TONGUES.

Hebrew is no longer believed to be the most ancient of human languages. Sanskrit itself has been dethroned by the 'Zend Avesta,' the sacred book of the Magi. As regards Europe, the tongues of the Finns and the Basques long enjoyed great favour in the eyes of the most learned philologists as the primitive European languages. Humboldt even asserted that Basque was strictly speaking the only European tongue, that which has undergone the least modification, and has retained the most of its original structure, a clear proof in his eyes of the great antiquity of the Iberian people by whom it is spoken. The opinion of the famous German philosopher has been widely adopted. Whitney himself considers the Basque language as 'the sole surviving relic and witness of an aboriginal western European population, dispossessed by the intrusive Indo-European tribes. It stands entirely alone, no kindred having yet been found for it in any part of the world ('Life and Growth of Language,' p. 212).

Now M. Bladé has shown that the Basques were not an *Iberian* people, since this word is a purely geographical and not ethnological term, applicable only to that part of

the population of the Spanish peninsula which had settled on the banks of the *Iberus* or Ebro. Moreover, M. Bladé has proved that, contrary to the assertions of Humboldt, the Basque tongue has changed since the fifteenth century to such a degree that it is impossible to explain the text of that time. Now this text is the earliest literary monument of that language, which is doubtless far more ancient, but, nevertheless, recent enough, since it is only known beyond the Pyrenees from the twelfth century, and on this side from the thirteenth.

M. Broca, however, agrees with Humboldt in considering Basque to be the only truly indigenous European language; and he believes it to be the most ancient of all those now spoken in our continent. The Finnish language, allied to the Basque in the opinion of some philologists, has in his opinion no analogy with it, unless it be in the well-known negative character of being an uninflected tongue. Whatever may have been said to the contrary, Basque offers also no analogy with the American dialects, nor with the Berber of Northern Africa. M. Broca considers the Basque language to be an Iberian idiom formerly spoken with dialects of the same family in Aquitaine, in the whole of the Spanish peninsula, and even throughout western Europe. The introduction of the Aryan tongues of Asia with the people who spoke them caused these Iberian dialects to disappear in succession; the Basque alone persisted, and hence it still forms an isolated spot in the midst of the domain occupied in Europe by Aryan or Turanian languages of an undoubtedly Asiatic origin.

M. Virchow, on the other hand, is disposed to conclude, from the likeness he sees between the skulls of the Guanchos of the Canary Isles and those of the modern Basques, that the latter and their language belong to the race proper to those ancient islands of which the Canaries are the last remains. But besides the fact that identity of language cannot be logically concluded from the similiarity of the skulls, and conversely, the Prussian *savant* himself observes that the time is not ripe for a well estab-

lished decision among so many conflicting opinions. The problem is yet to be resolved, and I fear that the solution may be long deferred.

With regard to the question whether there has been at any time, either in Europe, or in the other quarters of the Old World, a single parent language whence all others are derived, we have no hesitation in returning a negative answer with MM. Burnouf, Renan, and Whitney. 'No fact, scientifically analysed, proves that all languages are derived from a single stock; hundreds of facts indicate that certain centres of languages, probably in considerable number, were formed in Asia, in Europe, and elsewhere, from which ramified the languages and dialects of later times.' Burnouf, Schleicher, and Müller hold the same opinion.

Indeed, it is easy to conceive that, even before the formation of our most distinctly characterised modern races, migrations took place in different directions and owing to the changed conditions of life, that new races and new idioms arose of which the more and more marked divergences produced that variety of languages which justly excites our wonder at the present day, and is one of the finest privileges of humanity. Here, however, we must notice the remarkable fact that there is not always agreement between the linguistic type and the ethnic character of the race to which it belongs. Thus the Berbers, for instance, who undoubtedly belong to the Caucasian race, nevertheless speak a Semitic tongue, Arab, which, as is well known, it is impossible to connect with any of the Indo-European idioms. The Esthonians and the Lettons[1] speak an Aryan language, and are nevertheless, according to M. de Quatrefages, of Finnish origin. The Iroquois, the Dacotas, and the Algonquins appear to belong to the same race, yet their languages have nothing

[1] Letton appears to be the earliest Indo-Germanic language spoken in Europe. It resembles Sanskrit, the sacred language of ancient India, more closely than any other European idiom. It was therefore the precursor of the Greek, Latin, Keltic, German, and even Slav languages, which latter, nevertheless, offers a number of analogies with the tongue of the Vedas.

in common, at least as far as their vocabulary is concerned.[1]

But if identity of language has not always a great ethnic value, it is not the same with the *irreducibility*, that is, the impossibility of tracing them all back to a single common source. This quality seems the most convincing proof of the multiplicity of the centres of language. No one, for instance, would dream of deriving Chinese from Hebrew or from Sanskrit; these tongues have nothing in common. There existed therefore not one, but several primitive languages, the work of man obedient to one of the most imperious laws of his nature—the need of communication with his fellow-men.

It is easy to understand the impossibility of reviving their grammar or vocabulary, since they are all long since extinct. But it is a generally received opinion that all languages were originally monosyllabic, as Chinese remains to this day. The monosyllabic languages were succeeded by the agglutinative, which are characterised by the simple juxtaposition of the often numerous elements which form their words equivalent to a whole sentence; thence the names *polysynthetic*, *holophrastic*, *agglutinative*, by which they are variously known. The great majority of the American idioms belong to this class, the *Otomi* being an exception. Lastly, we have the inflected or classic languages. Such are the three successive stages of language before it attains its complete development.[2]

[1] This is a principle upon which Whitney insists, when he says that 'the incompetence of the science of language to pass any decisive judgment as to the unity or the diversity of the human race appears to be completely and irrevocably demonstrated;' and again, 'Wholly discordant languages are spoken by peoples whom the ethnologist would not separate in race from one another, and related languages are spoken by men of apparently different race.' (Whitney, *Life and Growth of Language*, p. 222.)

[2] The classification of languages into monosyllabic, agglutinative, and inflected, has hitherto enjoyed a great reputation; but Whitney, who is so great an authority on the subject, considers this classification as inaccurate and unnatural. 'The three degrees lie in a certain line of progress, but, as in all such cases, pass into one another. To lay any stress upon this as a basis of classification is like making the character

We have already said, and we cannot repeat it too often, that man creates the words of the idiom he speaks, in virtue of the incessant activity of his mind, of the necessity of a new word to express a new idea, and of the faculty he possesses of reasoning, of adapting his means to his ends, and thereby attaining them. But language as a whole is not, of course, the work of an individual, often almost an unconscious though a voluntary agent; it is the collective work of the entire society by whom this language is employed as an instrument. We make words as we make tools, at the demand of our needs or our convenience; the idea precedes the word, just as the conception of the tool preceded its manufacture. 'It is as impossible to doubt that the idea precedes the word as that the child exists before it is named, although the evidence is less palpable' (Whitney). Nothing is more true, and it is difficult to understand how the contrary theory was ever maintained.

Without pretending in the smallest degree to furnish the solution of the enigma which still puzzles the wisdom of our most learned linguists, we may, with some show of reason, imagine quaternary man expressing his feelings by cries resembling interjections, his most vivid perceptions by onomatopœia. His vocabulary was poor in words,[1] and almost entirely destitute of abstract terms; but his

of the hair or the colour of the skin the basis of classification in physical ethnology, or the number of stamens or the combination of leaves in botany. (Whitney, *Life and Growth of Language*, p. 227.)

[1] One of our most distinguished Orientalists, M. de Dumast, of the Institute, says: 'The older and more primitive a language is, whether savage or no matters little, the richer and more beautiful it is with intrinsic wealth and beauty.'—Quoted by Fee, in his *Philosophical Studies on the Instinct and Intelligence of Animals*, p. 131. This assertion does not tally with the numerous examples of very imperfect languages of modern savages cited by Sir John Lubbock. Chinese itself, the most unchangeable and the earliest crystallised of all known tongues, is far from being remarkable for the richness of its vocabulary, or of grammatical forms. The language of the Bosjesman, of the Botocudos, and of the Australian is far more imperfect still. Captain Burton says even that certain Indian tribes of North America, the Arapahoes for instance, have so poor a vocabulary that they cannot talk to each other in the dark, since they are then deprived of the resource of gesture language, which is indispensable to eke out their scanty words.

speech was rich in metaphors, teeming with images, and reflecting like a mirror or a faithful echo the lively emotions of his soul in the midst of a still virgin nature. A profuse employment of gesture accompanied the yet imperfect expression of thought and feeling. But if we can attain to a more or less exact idea of the early processes of speech, we have hitherto, unfortunately, no means of ascertaining what was the language or languages long since extinct of our first ancestors; so true is the saying that the human mind is to itself an eternal and yet ever-new problem.

We may mention, however, with a certain pride, that the palæontology of language, joined to comparative philology, has already led such men as Jacob Grimm, Max Müller, Schlegel, Schleicher, Pictet, Whitney, Hovelacque, Burnouf, &c., to very curious discoveries, and the future has probably many unexpected revelations in store for us. We need not, therefore, interpret too literally the discouraging words of M. Caro: 'The question of origin cannot be treated by experiment; we can advance nothing on these great subjects which can be thus verified.'[1] However this may be, man never was, in my opinion, this *Pithecanthropus alalus* whose portrait Hæckel has drawn as if he had seen and known him, whose singular and completely hypothetical genealogy he has even given, from the mere mass of living protoplasm to the man endowed with speech and a civilisation analogous to that of the Australians and Papuans, whose origin is attributed to the beginning of the diluvian period by the Prussian *savant*.

III. ORIGIN OF WRITING.

Man is born a draughtsman or a sculptor, just as he is born a poet or a musician. An instinct of imitation leads him to reproduce the forms of the surrounding objects, and is strongly developed even in the child. The rude figures which he traces on the walls, on the sand, or on paper, as soon as he can hold a pen or a pencil, bear

[1] Caro, *Comptes-rendus de l'Académie des Sciences Morales*, 1868.

witness to this inborn impulse, common to all mankind. If the drawings intended by the savage tribes of North America to represent men, animals, and plants, be compared with our own productions when we were seven or eight years old, we shall be struck by the resemblance, so great that even men of a certain erudition have been deceived by it.

Every one knows the story of the famous 'Book of the Savages,' which the Abbé Domenech, who had passed several years among the red-skins, regarded as the authentic work of the latter, as a record of great importance to the science of ethnology, whereas it is now proved that this supposed 'Book of the Savages' is nothing but a lot of rude figures drawn by the unskilled hand of the son of a German settler.

This likeness, among all the productions of the first efforts of the human mind, has been already noticed with regard to the flint weapons and tools collected from the most widely separated districts. It is no less astonishing when we come to study the writing of savage peoples, and even of those who have attained to some degree of civilisation. All of them, in inventing the graphic art, have aimed at giving substance to their thought, have endeavoured to materialise it, and if possible to perpetuate it; all have thereby wished to supply the want of absent words, and even to paint them to the sight for the present, and still more for future time. From identity of purpose naturally arose identity of means, and writing, multiplied by the genius of Gutenberg, has become one of the most powerful instruments of progress and civilisation.[1]

At first *ideographic* and entirely pictorial, as it still remains among several Indian tribes of North America, writing became *phonetic*, then *syllabic*, and lastly *alphabetical*, which is the apogee of Scriptural progress. But alphabetical characters themselves, those of which Cadmus the Phœnician is the traditional inventor, had a distinctly

[1] Bacon compares writing to a ship which crosses the vast ocean of time, and makes all ages share in the lights, the wisdom, and inventions of past times.

FIG. 140. EXAMPLE OF PICTURE WRITING. (After Lubbock.)

Indian petition, addressed to the President of the United States, to obtain possession of four small lakes (8), of which the superfluous water flows into a large one (10), the Lake Superior. No. 1 represents Odhcabswis, the chief of the petitioning tribe, whose clan is symbolised by the stork; 2, 3, 4, 5, 6, and 7 represent the symbols or *totems* of the other petitioners (marten, bear, tortoise, sea-cat, &c.). The eyes of the petitioners are connected with the eyes of the chief to express the unity of their views, their hearts to his heart to show the unity of their feelings. Lastly, a special line connects the head of the chief with the lakes they reclaim. The wavy line starting from the stork's head represents the idea of the request preferred to the President.

pictorial origin. *Aleph*, and *beth*, which are joined to make the word *alphabet*, had, the one, the form of an ox's head, the other, that of a tent or house; *gimel*, the *gamma* of the Greeks, represented a camel, *daleth* or *delta* a door.[1]

The first form of picture writing is merely the representation of the living creatures or inanimate objects, a tree, a stream, a lion. This is *picture-writing* proper, of which we here reproduce two specimens. The one is a contemporary Indian petition (fig. 140); the other an Indian love song, for which we are indebted to School-

FIG. 141. EXAMPLE OF PICTURE WRITING.—LOVE SONG.

1. The lover standing. 2. The same seated, playing on the magic drum. 3. The lover shut into a secret hut by his magic art. 4. The pair holding hands. 5. The woman represented in an island. 6. She lies asleep, her lover addresses her, and his magic power touches her heart. 7. His heart. 8. Represents her maidenhood. A line corresponds to each figure except the last. Here is the translation: my artistic talent makes me a god; listen to the sound of my voice, of my song, it is indeed my voice; I hide my head when seated near her: I can make her blush since I hear all she says of me; were she in a far distant isle I could reach her by swimming, even if she were in another hemisphere. I speak to your heart.

craft (fig. 141). This species of writing is naturally followed by pure symbolism, which consists in expressing abstract ideas by figures which suggest them in the mind of another—a bird signifying rapidity; a fox, cunning; a serpent holding its tail in its mouth, eternity; a sceptre, power. From this to phonetic writing there is but a step, but it is a long one. Here the image or symbol be-

[1] In astronomy we still use hieroglyphics to indicate the signs of the zodiac: ♈ = the Ram, ♉ = the Bull, ♊ = the Twins, ♐ = the Archer, ♎ = the Scales, ♒ = Aquarius. Horizontal undulating lines are the sign which represents water in the Egyptian hieroglyphics.

comes a sound. This is the *rebus*, which is really only a transition by the ideographic and phonetic forms.

The savages of America furnish a number of examples of these different kinds of writing, and Tylor cites some very striking ones in his 'Early History of Mankind.' The development of writing was arrested in China at the syllabic form; it has not reached the alphabetical. The characters, considerably modified by time and the use of the pencil, of which this writing is composed, are divided into two classes: (1) the *phonetic*, which give the sound; (2) the *determinative*, which indicate the sense. Thus the sign *door*, accompanied by the determinative *ear*, means to *listen*. The same sign *door*, joined to the determinative heart, expresses the word *sorrow*. The Chinese characters, which are purely syllabic, may be used with equal facility in Cochin China, Japan, and the peninsula of Corea, and to each it is possible to attach words which express the same idea, but which are mutually unintelligible to the people who employ them. Arab and Roman figures give an idea of this kind of writing; they resemble it inasmuch as the notions they represent are the same throughout the civilised world, but the word by which they are expressed varies with the nationality. The signs X and 10, for instance, represent everywhere the number which we call ten, but the enunciation of this number differs sensibly in different countries: δέκα (Greek), *decem* (Latin), *zehn* (German), *dieci* (Italian), *dix* (French).

The hieroglyphic writing of the Egyptians is much more learned but less complicated than that of the Aztecs, as is proved by a comparison of the tablets of Palenqué with the inscriptions at Rosetta or on the Obelisks. The characters employed in the Mexican inscriptions appear to have been formed of an assemblage of portions of symbols originally used in their integrity. The people who made use of this writing appear to have been inspired with the polysynthetic principle, the distinctive character of the American tongues, agglutination, compound or *bunch*-words as the Americans say. But it is doubtful if the hieroglyphs of Palenqué, of which the

signification is as yet unknown, ever had a phonetic value like those of the Egyptians and of the Chinese.[1]

It will be seen that hieroglyphic writing in general use among peoples widely separated by time and space, the Egyptians, Chinese, and American Indians, has everywhere an essentially pictorial character. No remains of writing have up to the present time been found in the places where the bones of quaternary man are found buried. Dr. Garrigou nevertheless says that he observed a species of hieroglyphic signs on several fragments of reindeer horn, which he collected in the caves of La Vache and of Massat, in Ariège. The author of this discovery is perhaps too ready to see in these the first traces of writing in our hands. It is also extremely doubtful whether the signs traced upon the slabs of sandstone found at Chaleux, mentioned by Professor van Beneden, should be regarded as graphic characters. Admitting that in the two above-mentioned cases we are really dealing with hieroglyphs, what is their signification? It may perhaps be found at some future time. 'When Grotefend, the first to undertake to decipher the signs found upon the Assyrian monuments, began his task, it was unknown whether they really constituted a written character, of if they were merely ornaments; not a word of the language to which they presumably belonged was known; we were ignorant from what epoch they dated. Neither was it known whether the alphabet was phonetic, syllabic, or hieroglyphic. Now at the present day we are acquainted with the cuneiform inscriptions of Cyrus, Darius, Xerxes, Artaxerxes I., &c. We are provided with translations, grammars, and dictionaries of them.' (F. Garrigou, 'L'Âge du Renne dans la Grotte de la Vache, près de Tarascon [Ariège],' p. 5.)

[1] A few examples are however cited, which tend to prove that, at the time of the conquest, the Mexicans were in process of giving a phonetic value to their hieroglyphs. The name of *Itzli-coatl*, for instance, the fourth king of Mexico, is represented by a serpent (*coatl*), from the spine of which obsidian knives (*itzli*) protrude; whence *Itzli-coatl*, like our *rebus*. (See Tylor, *Early History of Mankind*, and Evans, *Revue Scientifique*, 1873, p. 657.)

Archæology has not said its last word on the subject of records of prehistoric ages. According to Grote, writing was unknown in the time of Homer and Hesiod (850-776 B.C.) Now the excavations made at great expense by Schliemann on the site of ancient Troy have brought to light an earthenware vessel, made without the help of the potter's wheel, and bearing an inscription probably in Trojan characters. Homer sang of the fall of Troy about seven hundred years after the taking of the town. We must therefore conclude, in spite of Grote's assertion to the contrary, that writing existed in Illyria long before Homer. We must not forget, however, that Sir John Evans, a most competent authority, affirms that writing was unknown in the age of stone, and that no well-established fact has yet been discovered in support of the contrary opinion.

CHAPTER VII.

RELIGION.

I. RELIGIOUS IDEAS OF PRIMITIVE MAN.

I MUST begin by declaring, to avoid any misunderstanding, that I leave entirely on one side all revealed religion. Revealed religion commands our faith and subjugates our reason; science requires freedom of search and appeals to facts. Now positive facts, in all that concerns the religious ideas and ceremonies of our earliest ancestors,' are as yet very few in number, so few indeed that there is not, to my knowledge, a single one from which any certain conclusion can be drawn. We are therefore reduced to induction and analogy, and both of these means of proof are often deceptive. Yet it cannot be denied that God has always revealed himself to man in his works, and whatever Statius may say, the gods are not merely the creation of fear. The mind has an equal share with the heart in the conception of a divine Being, of a Supreme Cause; but this idea was of slow progressive development in primitive man, advancing almost imperceptibly by an instinctive and spontaneous movement. 'Just as the knowledge of our *ego* and of the exterior world was not acquired spontaneously, without effort, reflection, or experience, so the idea of the existence of God, at first embryonic, so to speak, has need, in order to attain its complete development, of slow and successive efforts of the human mind which has conceived it. Here we have not, as yet, direct intuition; there is only slow and painful labour, which, from induction to induction, reflection to reflection, leads us at length to this supreme affirmation: God is.' (Compayré.)

M. Ampère has given us an interesting account of a young American girl named Laura Bridgman, deaf and dumb from her birth, and shortly afterwards deprived of her sight by an illness. She was consequently reduced to the senses of touch, taste, and smell. Dr. Howe and his wife undertook the education of this child. By their united efforts, and their wonderful patience and humanity, they succeeded in teaching Laura to read and write, and even the two simplest rules of arithmetic, addition and subtraction. She even acquired the notion of a God, in the same way as philosophers, by the idea of causality. 'There are things which men cannot produce,' she said; 'the rain, for instance.' Here M. Ampère justly remarks, 'It was not the spectacle of nature speaking to her understanding; nature was veiled, and the thunder was dumb to her; the sensation produced by the fall of a drop of water was sufficient to give rise in her mind to this question as to the *cause*, which man asks of necessity, and to which there is but one answer: God.'

Primitive man followed no other method. The modern savage thinks but little, but he feels readily and keenly. The great scenes of nature which are ever before his eyes, the unceasing peril which threatens his life, poor and uncultivated as it is, the conviction so often impressed by his own weakness, the pressing need of some support, that inborn yearning for the unknown,[1] that love of mystery so deeply rooted in the human heart: here are more than enough reasons to lead man to the conception of a Supreme Cause, to the notion of a divine Being.

The idea of God is at first individual, infinitesimal, sometimes strange and childish; it grows purer and larger with the growth of the natural intelligence and acquired instruction of him who conceives it. Then from being individual it becomes collective; and finally, passed from one to the other, it progresses gradually until it attains to this formula, of which the abstraction borders on the incom-

[1] 'Yes, the God we must believe in is a hidden God,' say the Roman Catholics themselves.

prehensible: 'Power, love, and wisdom, united yet divided, compose His being.'

Man, then, as he came from nature's hands, was endowed with too weak an understanding to enable him to attain at once to a clear and precise knowledge of the divinity; still less was he capable of understanding the refined and almost mystic dogma of the higher religions, for dogma is the work of science and religion, the expression of their results. But in the beginning it was nothing but the expression of the thought of the individual, a thought soon submitted by others to an examination more or less severe, then adopted by the majority of the tribe, and passing afterwards into a collective belief. It is easy to understand that there may have existed, that people still exist in a savage condition, without a generally recognised dogma, and consequently without religion, using the word in its most commonly accepted meaning. On this essential point we think we may place great confidence in the evidence of Livingstone, Sir Samuel Baker, Dr. Monnat, Dalton, Lichtenstein, and many other travellers as learned as they are trustworthy. Now these travellers assure us that in the interior of Africa, in America, and elsewhere there are entire tribes who have no idea of the divinity, no notion of a future life; we may even go so far as to say no idea of morals. Dr. Monnat says, speaking of the Mincopies, or inhabitants of the Andaman Isles: 'They cover themselves with mud and tattooing, but they wear no clothes; they seem indeed to be deprived of any sense of shame, and many of their customs are like those of the brute. They have no idea of a Supreme Being, nor religion, nor any belief in a future life. . . . They possess no dogs nor domestic animals of any kind.' Another modern traveller, Sir Samuel Baker, affirms that the negro of Central Africa has not the remotest idea of a Supreme Being, or First Cause of the universe, and his understanding is incapable of such a conception. The feeling of adoration is unknown to him. He possesses no representation of any deity whatever. For him, immortality is purely genealogical; the indi-

vidual survives only in his descendants. If he performs any superstitious ceremony, if he sacrifices birds, it is only to seek in their convulsive motions prognostications relating to the ordinary interests of life; but no essentially religious idea is connected with the practice, invented by the imagination of a magician, and maintained by blind tradition. Livingstone affirms that 'among the Bechuanas and all Central African tribes there is a total absence of worship, idols, and of all religious ideas.'[1] Still more recently Sir Massinger Bradley spoke of an Australian tribe which lived on the shores of the lake in a district situated in 35° lat. south, and 139° 30′ east long. Their language is monosyllabic, 'consisting,' he says, 'of cries more or less resembling those of animals. . . . They have no superstitions of any kind, and have not the least notion of a future life.[2]

Lastly, we are informed by the scientific commission of Mexico that the Indians in the neighbourhood of Santiago, whose physical character resembles that of the Chinese and the Mongols, had no religious ideas before the coming of the Conquerors. 'Many writers who are authorities on this matter,' says Sir John Lubbock, 'are of opinion that no people is destitute of some sort of religion. This theory, however, does not agree with the statements of many trustworthy observers. Sailors, merchants, and philosophers, Catholic priests and Protestant missionaries, in ancient and modern times, and in every quarter of the globe, concur in affirming that there are races without any species of religion. Their testimony has the more weight that in many cases this fact has greatly surprised the observer, and was in complete opposition to all his preconceived ideas. On the other hand, it must be owned that travellers have denied the existence of a religion, because the creed it professed was entirely contrary to our own. The question as to the universal existence of religion among men is after all, in great measure, a matter of definition. If to constitute a religion a mere feeling

[1] *Report of the Anthropological Society of Paris*, p. 227, 1864.
[2] *Revue Scientifique*, Nov. 15, 1873, p. 473.

of fear, the single idea in man that there are very likely beings more powerful than himself, be sufficient, it may, I think, be admitted that the entire human race is in possession of religion.'

Professor Broca, on his part, in a paper remarkable for its good sound sense and scientific loyalty, agrees with several of the most distinguished members of the Anthropological Society of Paris in declaring that he has no doubt whatever 'that there are among the inferior races peoples without worship, dogma, metaphysical ideas, or collective belief, and consequently without religion.'[1] It is needless to say that after such an assertion, M. Broca, far from considering the religious instinct as universal and inseparable from human nature, sees in it where it exists merely one form of submission to a higher authority, an effect of the teaching received in childhood, but not an original characteristic faculty.

This opinion found, as we have said, a number of adherents in the Anthropological Society of Paris. M. de Quatrefages continues nevertheless to believe that the religious instinct is one of the original and essential characteristics of humanity, and he reckons in the list of theistic and even religious people, the Australians, the Melanesians, the Hottentots, the Kaffirs, the Bechuanas, the Yebous, the Mincopies, in fine, all the races among whom the authors we have quoted deny the existence of all religious ideas. ('The Human Race,' page 349.)

If we accept the Abbé Lamennais' definition of religion, as the 'assemblage of all the necessary laws of creation,' it is evident that, under this acceptation, religion is only accessible to philosophers who have long studied these laws; but if we accept this other definition of the same author, 'the union of man with God and of man with man,' it is not less evident that religion may be understood, felt, and practised as well by the savage as by men who have attained to an advanced state of civilisation.

[1] *Report of the Anthropological Society of Paris*, 1866, p. 53.

In order to be properly qualified to discuss the question at issue, M. de Quatrefages wisely recommends a thorough and close study of the inferior religions; for in all of them the observer will find in a state of embryo, so to speak, the two following general formulas, which, in fact, sum up all the doctrines and all the dogmas of the great religions which are now spread over the surface of the globe (Brahminism, Buddhism, Judaism, Mahometanism, Christianity):—

1. Belief in beings superior to man, with power over his destiny for good or for evil.

2. Belief in an after life, a future beyond the grave.

'Every people, every man who believes in these two things is religious, and observation is ever increasing the number of proofs of the universality of this character.' ('The Human Race,' p. 356.)

M. Emile Burnouf, on his part, justly points out that if man, however savage we may consider him, 'had not cast a thoughtful glance at Nature, who brings him his joy and his sorrow, if he had not thought that he perceived in her invisible and sovereign forces, he would not have conceived the idea of condensing in some sort the powers of the universe in a piece of wood, a stone, in some remains of a coarse tissue.' This is fetichism, it will be objected. It is so, I readily confess, but fetichism is precisely the lowest and most rudimentary natural expression of religion; it is the worship of tribes belonging to the lowest degree of the social scale. From fetichism to the worship of idols made in the image of man, to the worship of man himself, there is but a step. There is a manifest tendency to anthropomorphism in all the religions which are rightly styled inferior. It even recurs more or less obviously, or more or less disguised in the great modern religions. Suffice it to mention here the Grand Lama, the object of worship of a whole people, for we need not name all the heroes and gods of Olympus, so like in many respects to the most ordinary mortals. There is a foundation of truth in the jest that if God made man in his own image, it must be owned that man does as much

by him. Jehovah himself is frequently represented in Roman Catholic churches under the form of a venerable and majestic old man. According to Lubbock, the Tartars of the Altai Mountains picture God also as a white-bearded old man, but at the same time they dress him in the uniform of a Russian officer of dragoons. ('Origin of Civilisation,' p. 227.)

Led astray by the fear or horror inspired by certain animals, by the services which others render him, or by the erroneous ideas he has conceived respecting them, man has often rendered them a religious homage. This animal worship, so extensive in India and in ancient Egypt (the ox, apis, anubis, the sacred ibis), has left traces, in a completely symbolic form it is true, even in Christianity itself (the Paschal Lamb, the White Dove, symbol of the Holy Ghost): so true it is that man is *one* in spite of apparent diversities.

If man is morally *one*, if the entire human race is now in sympathy with respect to certain ideas, certain feelings, certain tendencies which recur equally in every part of the globe, it is exceedingly probable that from the earliest quaternary times, and therefore all the more in the following age, we shall be able to find traces of a collective belief in superior beings, good or evil, and in a future life. From the natural impulse to be rendered acceptable to the one, to endeavour to withdraw from the hurtful power of the other, arise prayer, adoration, worship, sacrifice, offerings, and superstitious practices of every kind. But as soon as the idea of a God is clearly conceived, the great monotheistical religions follow as surely as the conclusion follows the premisses. In all, the fundamental principle, that is the dogma, is at bottom the same; the ceremony, the form of worship, the religious paraphernalia, the outer and accessory forms alone vary (Judaism, Mahometanism, Christianity).

II. WORSHIP AND AMULETS.

We will now enter into some details more especially relating to prehistoric man. M. Piette found in the cave

of Gourdan (reindeer age) a species of amulet worthy of serious consideration. This is a disc pierced with a hole in the centre, from the circumference of which start diverging lines. The author of this discovery observed the same sign engraved three times upon a wand of office, and he considers it to be the image of the Sun God, worshipped, as he thinks, by the troglodytes of the Pyrenees. This interpretation seems plausible, but it needs more numerous and more decisive proofs to be universally adopted.

The crescents of the Swiss lake dwellings, which were at first regarded as religious symbols indicating the worship of the moon, appear to have been merely rests for the head during sleep, or destined perhaps to preserve the construction of an elaborate head-dress. The inhabitants of the Fiji Isles still use wooden pillars for a similar purpose, and also to render the occiput round and protruding. M. de Quatrefages is inclined to regard a mammoth bone found by M. Ed. Dupont in the hole of Chaleux, in Belgium, as a species of fetich worshipped by the inhabitants of the district. The mammoth had at that epoch been long extinct, and it is probable that they mistook one of its bones for that of a giant, and were thereby led to worship it.

However this may be, the wearing of amulets, a custom which became almost universal at the end of the reindeer age, and during the whole of the neolithic period, shows at least the existence of superstitions very similar to those which still reign in our country districts, and even in the heart of our so-called civilised towns: the traditions of old times handed down to us, which perpetuate the memory of one of the earliest stages in the life of humanity.

In his interesting work upon the Nuraghi of Sardinia, the Abbé Spano regards the monoliths (a species of *menhir* or *stela*) which are placed in front of the dwellings, as representing the sun, the creator and life-giver of all being, otherwise the Baal or Melarth of the Sidonians. Some of these monoliths, smaller than the preced-

ing, and carved with the representation of two breasts towards the summit, are probably figures of Astarte, the moon, the inseparable companion of Baal, who, by the humidity which she diffuses over the whole earth, encourages the increase of all living creatures (fig. 57). If we were to believe the Abbé Spano, this worship of Baal and of Astarte was imported into Sardinia by the first emigrants from the plains of Sennaar. According to the Sardinian peasants, on the other hand, these monoliths are human beings, who left the true religion to worship the sun and moon, and whom God punished by changing them to stone after having deprived them of their feet and hands. Probably neither peasant nor *savant* is right, since the men of the archæolithic and even of the neolithic age are far anterior to the Chaldean emigrations.

If, as M. de Baye supposes, the female figures rudely carved upon the chalk walls of the artificial caves of the Marne really represent a divinity, we must conclude that the inhabitants of Champagne practised likewise, in the later stone epoch, the rites of a religion akin to fetichism or anthropomorphism.

Cranial Amulets, and the Immortality of the Soul.—We have already given from M. Broca's description an account of the processes employed in trepanning the skulls of infants and of adults in the neolithic age. This operation was sometimes practised upon the living subject, especially upon children and young people (surgical trepanning[1]), and sometimes upon the dead body before burial (posthumous trepanning).

In all time, and even in modern days, superstition, the faithful companion of ignorance, has been allied to medicine and surgery. In every epoch certain nervous diseases, such as convulsions, delirium, epilepsy, and madness, have been considered either as sacred, or as the indication of the possession of body and soul by demons

[1] M. Broca remarks that the term 'surgical trepanning' is not strictly correct, since the hole made in the bone of the skull was not obtained by means of a pointed instrument moved in a circle, but by merely scraping the surface with a sharp flint blade

or other evil spirits. Hence the idea naturally arose of opening a door through which to expel them. Hence also the mystic origin of trepanning practised upon the living subject.

And as convulsions and epilepsy (a supposed sacred disease) are commoner in children than adults, we find a large number of perforated or trepanned skulls among young people. The subject himself was considered to be beloved of the gods if he survived the operation, and was

FIG. 142. SKULL TREPANNED DURING LIFE AND AFTER DEATH, TAKEN FROM ONE OF THE DOLMENS CALLED CIBOURNIOS, OR TOMBS OF THE POULACKES. Presented to the Anthropological Institute of Paris by M. Prunières.

A B, Healed edge of the surgical trepanning. B C, A D, Edges cut or sawn after death. This same skull is shown on page 354, seen from above.

cured of the disease. The bones of his skull were reputed to possess wonderful therapeutic properties; they counteracted witchcraft, and preserved from disease. This was more than enough to cause our neolithic ancestors to procure the *trepanned* fragments which were the object of their veneration, and to wear them as amulets and precious talismans.

After the death of persons who had while living undergone surgical trepanning, a sort of posthumous trepanning was practised upon them, which consisted in taking from the skull circular pieces and fragments of various forms, taking care always to preserve on one of the edges of each piece of bone a part of the cicatrised edge of the original opening (fig. 142). That was in some sort the authentic signature, the trade-mark of the coveted talisman, which was thereby rendered so precious to the fortunate possessor. The healed edge does in fact exist upon nearly all

FIG. 143. CRANIAL AMULET, WITH GROOVE FOR PASSING A CORD. Taken from the dolmen called Cave of the Fairies, in Lozère. Collection of M. Prunières. (Natural size).

FIG. 144. IRREGULAR CRANIAL AMULET, WITH A HOLE IN THE MIDDLE FOR THE PASSAGE OF A CORD. Collection of M. Prunières. (Natural size).

the posthumous amulets: which proves beyond a doubt that the subject trepanned while living had long survived the operation. This edge is smooth; but it is distinguished from the remaining edges of the amulet, in that the newly-formed bony substance covers the cells of the diploe, whereas the cells are visible in the other parts from the very effect of the polishing (figs. 143, 144).

The discs with polished edges were, it appears, fancy amulets, and are much rarer than the unpolished ones.

Both were, however, cut from the bone of the skull with a flint knife or saw, at the celebration of the funeral.

We have said that the most skilfully wrought discs, those which were of most value, were found in skulls from which a great part of the outer bone had been removed by posthumous trepanning. They had evidently been purposely placed there. But M. Broca naturally asks what end these intra-cranial amulets were intended to serve. 'Were they a symbol, a representation of the great portion of the skull removed by the operation of trepanning? It is hardly likely, since any fragment of a skull might have been employed for this purpose; and the precious amulet would not have been so lightly sacrificed. The intra-cranial amulet meant much more than that. It was a *viaticum*, a talisman which the deceased carried away with him into another life to bring him luck, and to protect him from the influence of the evil spirits who had tormented his childhood. But, even if we admit the first hypothesis, it none the less indicates the belief that a new life awaited the dead; for otherwise there would have been no motive whatever for the ceremony of restitution. The study of prehistoric trepanning and the attendant ceremonies prove, therefore, incontrovertibly, that the men of the neolithic age believed in a future life, in which the dead retained their individuality. It is, I think, the earliest epoch to which we can attribute this belief.'

We remark, finally, that prehistoric trepanning was practised in the land afterwards known as France during the whole of the neolithic age. Undoubted traces of the same custom are also found in the dolmens of Africa, and even, although it is true with a different purpose, in Mexico, Peru, and the Mounds of Michigan.

Worship of the Dead.—We come now to consider the signification of those female figures with pointed nose and prominent breasts, found in the artificial caves of Champagne, and which recall to a certain extent the figures of Minerva, with the owl's face, γλαυκῶπις Ἀθήνη, which unknown artists have modelled on the great clay

vases dug up from the ruins of ancient Troy by Dr. Schliemann.[1]

How are we to interpret these facts? What correlation exists among them?

If it be true, as Herbert Spencer supposes, that the worship of ancestors and of the dead is the first origin of all religions, the burial caves of the Marne, and of a great

[1] According to M. Em. Burnouf and Schliemann himself, the vases in question represent the goddess Minerva, and testify to her primitive worship in Greece. With regard to the *swastikas*, which nearly always accompany them, they are, in the opinion of the authors we have just cited, true religious symbols, similar, but far anterior to the cross of the Christians. On the other hand, the Abbé Brasseur de Bourbourg tells us that the Mexican Indians adored the cross long before the conquest, and invoked its aid in praying for rain after a long drought. According to Wilson, the Maltese cross often adorns the antique pottery of Peru, and it is also found in the carvings of Mitla and Palenqué, a circumstance which has given rise to the most extravagant deductions and the most absurd explanations on the part of archæologists, who, not wishing to go back earlier than the time of Christ, regard the crosses figured upon non-Christian monuments as a religious symbol formed by the reunion of four Greek *gammas* (γ). Now we know at the present day beyond all doubt that these supposed *gammas* are nothing but the *swastika* 卐 of the Brahmans of India, that is, the representation of the wooden instrument of the same name employed with the *pramanthâ*, or fire-stick, to produce the sacred fire, *agni*. This sign is figured in the Ramayana on the prow of King Rama's ship, who certainly knew no Greek; and it appears also on a number of Buddhist monuments. Lastly, we know that the followers of Vishnu make this sign upon their forehead, as did the Christians of the early Church. M. Gabriel de Mortillet has proved that the sign of the cross, used as a sacred emblem, preceded by a thousand years the introduction of Christianity into Gaul. It may be seen on the pottery found at Aix, in Savoy, on more than half the vases taken from the *terramari* of Emilia (age of bronze), lastly, upon all the tombs of the cemeteries of Golascua, near Lago Maggiore, and of Villanova, near Bologna (age of iron). The cross then occurs everywhere, as M. Em. Burnouf justly observes; but is he right in adding solely in the Aryan race? The earrings of Mitla and Palenqué, the black earthenware of Peru, mentioned above, justify our doubting this assertion. But, it is now established by undoubted proofs that the sign of the cross was known and employed as a religious symbol long before the birth of Christ. With regard to the meaning of the sign resembling a St. Andrew's cross, which MM. Lartet and Christy observed upon an arrow head of reindeer-horn (*Rel. Aquit.* pl. x. fig. 6) found by them in one of the bone caves of Périgord, we shall not try to see therein the sign of the cross dating from the age of mammoth and cave-bear, and many will be inclined to imitate our reserve.

many other places, the dolmens and monoliths of Sardinia would have an important bearing upon the question. Nothing prevents us from considering, indeed everything leads us to regard, these monolithic monuments as the expression of a religious idea, a worship of the dead, based upon the notion, more or less distinct, or more or less vague, of a future life. What, moreover, could be the meaning of these weapons, these provision vessels, these funeral urns, found in the gigantic tombs in the burial caves and grottos, if not an affectionate respect for the dead, the idea still completely material and rude of a future life, similar in most respects to the present, and subject to the same necessities?

The famous cave of Aurignac (Haute-Garonne) seemed to have furnished an invincible proof in favour of the existence of religious ideas and practices, and of a worship of the dead at an epoch as early as the cave bear. At sight of the human bones found buried therein, people talked of funeral ceremonies and feasts, of well-defined religious beliefs in times far anterior to all history and all tradition. The only mistake was one of date, for the most recent researches of MM. Cartailhac and Trutat have proved that all these practices must be attributed only to the neolithic age.

Dr. Noulet arrived at the same result in exploring with the care and wisdom which characterise him the burial place of the Herm, reputed to be much more ancient than it really is. On the other hand, the human bodies lying above the ancient hearths of Solutré prove that, as early as the reindeer age, the tribe which had settled in this district near Mâcon rendered funeral honours to their dead, and that they possessed notions of a future life nearly similar to those which are revealed to us in the age of polished stone.

From the above facts and considerations, it results that we possess but very few proofs and positive facts testifying in favour of the existence of religion among our ancestors previous to the neolithic age. But if it be true that, as Lamennais says, every being tends towards God,

tends to unite itself to him as far as its nature allows; if religion itself is but this union realised by heart and mind, if the idea of a future life is only a spontaneous aspiration after the Infinite, primitive man himself cannot have been exempted from this impulse of all human nature.

III. CANNIBALISM AND HUMAN SACRIFICE.

It is extremely probable that the primitive peoples of Europe were addicted to cannibalism, though we have hitherto no certain proof of the fact. Yet, when we consider that this barbarous custom is still widely diffused in Polynesia, in New Zealand, in Australia, in the islands of Sunda and Sumatra, in Central and Southern Africa, and among some of the tribes of Hindostan and of America; when Strabo and Pliny assure us that in their time the Germans and Kelts were cannibals; lastly, when Cæsar says that the Vascons were still anthropophagous, we should have no reason to be surprised if later researches placed it beyond a doubt that quaternary European man resembled the Vascons in this respect.

Even now there are indications which seem to confirm this hideous resemblance. In certain caves human bones have been discovered, more or less charred or split like those of animals, probably for the purpose of extracting the marrow, which was considered as a great delicacy. Some of these bones are marked with scratches, rare, but quite visible at their spongy extremities, and even the print of teeth, which certain palæontologists believe to be human.

At the station of Saint Marc (reindeer age), near Aix, in Provence, M. Marion found among the remains upon the hearths some calcined human bones, broken and split to allow of the extraction of the marrow. He unhesitatingly concludes from this fact that the tribes of the archæolithic age occasionally fed upon human flesh. It is worthy of note that all these carbonised bones split lengthways belong to young people, and that the station of Aix shows no sign of having been used as a place of

burial. M. Capellini also says that he has recently found traces of cannibalism in Italy.

Observations similar to the preceding had already been made in Scotland upon the bones of women and children, by Richard Owen; in Belgium, by Spring; and those two *savants* had suspected them to be proofs of the practice of cannibalism. M. Worsaë likewise believes in the existence of anthropophagy and human sacrifice among the ancient inhabitants of Denmark.

It is, nevertheless, possible that the scratches or marks in question are merely the work of certain rodents—mice and rats for instance. It is to these animals that Dr. Noulet attributes very similar marks observed upon three portions of a human humerus taken by him from a sepulchre, dating from the age of polished stone, and wrongly attributed, it seems, to the epoch of the cave bear (cave of the Herm).[1]

Whether we adopt this opinion or no, it is not unreasonable to imagine that the hunger of the first inhabitants of European soil was not always satisfied, and that their savage passions led them to feed, at least accidentally and locally, upon the flesh of their fellow-creatures. The same causes produce everywhere the same effects. M. Schaffhausen, therefore, does not hesitate to say, 'We are no longer astonished at the description of a people addicted to cannibal practices. We find among all peoples the traces of this primitive barbarism: it is in some sort a necessity to which they were all at one time subject.'[2]

Carl Vogt is even more explicit upon this important point. 'There is not,' he says, 'a single race, a people of importance, or any important geographical group of men, among whom cannibalism and human sacrifice did not formerly exist. Black, brown, yellow, and white-skinned races, woolly-haired and smooth-haired men; Europeans,

[1] See in the *Mémoires de l'Académie des Sciences. Inscriptions et Belles Lettres de Toulouse*, 1874, Dr. Noulet's work entitled, *Étude sur la Caverne de l'Herm, particulièrement au point de vue de l'âge des restes humains qui en ont été retirés.*

[2] *Revue Scientifique*, 1872, p. 1064.

Asiatics, Africans, Americans, Australians, and Polynesians, Semites and Hamites, all without exception have sacrificed and devoured their fellows; and, where historical documents and writings are wanting, the broken and gnawed bones bear witness to the fact.'[1]

Far from subscribing to the paradox of Rousseau, that all things are perfect when they leave the hands of Nature, M. H. Bouley[2] sees in primitive cannibalism the proof of a considerable imperfection. 'Man,' says he, 'when he left the hands of Nature,' to quote Rousseau, 'was not absolutely scrupulous in his strife for existence, and if he fed upon the flesh of the brutes he procured by the chase, a morsel of that of his fellows was not revolting to him. Hunger was his justification; but, if this means of nourishment may be explained, and even excused by the necessity of the time when it was commonly practised, it should not be invoked as a very convincing proof of the perfection of primitive humanity. On the contrary, a great progress was soon realised, and humanity made a step towards a better state of things, when the conquest of domestic animals assured to man his subsistence for the morrow. This point of view magnifies considerably the services for which we are indebted to our inferior brethren, as Saint-François de Sales calls them, who saved man from himself, that is from the fury of his unsatisfied appetite, which drove him to prey upon his fellows.'

In truth, as soon as man begins to cultivate the land, as soon as he is in possession of domestic animals, it is very rare that he does not renounce the practice of feeding upon human flesh, supposing that he had formerly been accustomed to do so. The natives of the Society Islands are an instance in point, for their admirable climate and luxuriant vegetation favoured the transformation wonderfully; as also are a number of wandering and savage tribes in the New World, who have left a condition of extreme barbarism, and are now attached to the soil—thanks to those who gave to them, with words of peace,

[1] *Prehistoric Congress of Bologna*, 1871, *Report*, p. 328

[2] *Revue Scientifique*, 1875, p. 31.

the first domestic animals, and the first notions of agriculture. These tribes, formerly cannibal, have gradually become more civilised; the life of their neighbours has become sacred, as it should be, to all the members of that great family which is called humanity.

The legends of the fabulous times of Greece and Egypt are not myths created at will by the fertile imagination of these ancient peoples. Ceres and Triptolemus, by the invention of the plough, really gave birth to civilisation.

But, unfortunately, hunger is not the only motive which leads or has led certain peoples to the practice of cannibalism, and has even induced them to make it a national institution. The abuse of absolute power, vengeance, superstition, and prejudice claim also a large share in this barbarous custom, a crime of high treason against humanity. Thus, for example, in the Viti Islands, in an admirable climate, among a people cultivating the yam, skilled in weaving and the making of earthenware vessels, cannibalism was, in 1854, a national institution at Mbau, the capital of the island and the residence of the King Cakombau; human flesh was publicly sold; the vessels and ovens in which it was cooked were never cold; and there were slaughter-houses in different parts of the island, where human victims were daily sacrificed, and in greater numbers at the celebration of certain solemnities. Messrs. Seaman and Pritchard, eye-witnesses of the scene, give a graphic account of the massacre of hundreds of prisoners and criminals, in honour of the king's son, who, having arrived at the age of manhood, was about to put on the dress of the *maro*.

'The corpses were piled together in an enormous heap, on the top of which a living slave was thrown. The initiated youth, naked until that day (for only the men wear a rag of clothing), separated himself from the companions of his childhood, climbed up the frightful scaffold of corpses, and, standing upon the breast of the living slave, he waved a sword and mace, while the priests invoked upon him the protection of the genii, and prayed them to make him conqueror in every battle. The assembled

crowd was accustomed to mingle their applause with these horrible imprecations. Then two uncles of the prince mounted in their turn the heap of victims: it was their office to gird him with the *maro*, a belt of *tapa*, a texture worn in the country, white as snow, and only six or eight inches in width, but two hundred yards in length, so that he was completely enveloped in it.'

'Quite recently (June 1878), one of the best informed superior officers in the French navy, M. Henri Jouan, who has long resided in Oceania, addressed the Linnæan Society of Normandy upon this subject. We regret the impossibility of reproducing the whole of this interesting paper which he has been kind enough to communicate to us, and which brings new proofs in confirmation of the theories which we have already made known in the *Revue Scientifique* of Sept. 1877. As an eye-witness of the facts, M. Henri Jouan speaks with undoubted authority. Now it results from his observations that all the peoples of Oceania formerly practised, or still practise, cannibalism to a degree which tends to diminish, and even to disappear, at the present day, but which reveals a sort of primitive and unconscious instinct, which even now at times amounts to ferocity. Nothing, not even the horrible tortures inflicted by the savage tribes of America upon their captives, can equal the refinement of cruelty to which the unhappy victims of the vengeance, prejudice, or superstition of the Maoris of New Zealand or the natives of the Fiji Isles are exposed.

We mentioned just now the ceremony of the *maro*, and the bloody sacrifices which accompany it; but it is impossible to form an idea of the brutal despotism and cold-blooded cruelty of the Fijian chiefs in certain circumstances, the horrible details of which are told us by the sailor Jackson, of the English navy. Can it be believed that living men were used as rollers to facilitate the launching of a large and heavy canoe? These wretches were wrapped in plantain stems which made them look like round beams of wood, and their thickness was so calculated that they might be slowly crushed during

the operation. 'Another time,' says M. Jouan, 'in building the house of a chief, living slaves were thrown beneath each of the pillars; they were supposed to support the roof of the houses over the head of the chief.' What, when compared with these horrors, is the rape of women and children intended to be merely killed and eaten upon the occasion of some national *fête* or any other event of importance?

The influence of cannibal customs and the prejudices attendant on them is so great, that in 1861, during the war made upon the English by the Maoris to recover their independence, the barbarous inhabitants of the south of New Zealand tore out and devoured the hearts of English soldiers killed in battle, imagining that they would thereby inherit the courage of their enemies, whose superiority in every respect they fully recognised. Yet M. Jouan adds, from whom we also borrow this characteristic detail, these same Maoris were Christians, ardent Protestants, who, some short time previously, had bitterly complained that the English had broken the Sabbath in attacking them by surprise one Sunday in service-time.

Besides those already mentioned there is yet another cause for that craving for human flesh which is often overpowering. Once formed, this taste, depraved in the civilised state, but partly natural and almost universal, it seems, in the savage or half-barbarous state, may sometimes become really irresistible. In nearly the whole of Oceania the wars are nearly always undertaken merely for the avowed and premeditated purpose of feasting upon the flesh of the vanquished.

In the Marquesas Isles women and children alone figure in the feast of the cannibals. And why? Because the flesh is more tender and delicate than that of men. The latter, according to a *gourmet* well qualified to judge (a chief of the tribe of the Naïkis of Noukahiva), is even much inferior to pork. The New Caledonians find the flesh of white men bad and terribly salt; neither do they value that of the tribes who dwell upon the coast, because it has a very disagreeable taste of bad fish. A number

of observations made by M. Jouan upon the tribes of Oceania whom he has been able to study at leisure and at first hand, lead him to conclude by analogy and induction that our prehistoric ancestors practised, like them, cannibalism and human sacrifice.

Even in our own day the sacrifice of human victims is carried out upon a large scale in Dahomey, and the king himself does not scruple to stain his royal hands with the blood of his subjects, or of prisoners taken in his wars with hostile tribes. Is it possible to carry to greater length the abuse of absolute authority, cold-blooded cruelty, or contempt for human life?

Among savage tribes, to kill an enemy, or to expose him to horrible torture, and then to devour his quivering flesh, is an almost universal custom; to offer him to the gods is a homage which they claim, a most efficacious means for obtaining their favour or appeasing their wrath. It is also the surest method of inoculating the donor with the courage, strength, and all the moral and intellectual qualities of the victim; in a word, of assimilating his soul, as the Maoris of New Zealand believe. This is precisely the explanation of the cannibal practices and bloody sacrifices which still obtain in modern days, not only among the barbarous Polynesians, but also among nations who have long emerged from a state of barbarism, and who are, moreover, in daily contact with the advanced civilisation of the English in India, or of the French in the Marquesas Isles, and even in Algeria.[1]

Voltaire had good reason for his surprise at the wide diffusion of the atrocious customs found even among tribes remarkable for their refined and hospitable manners. How is it, he said, that men so widely separated should be unanimous in such a horrible practice? Must we believe

[1] A quite recent event (1873), the assassination of Captain Hart and his wife, who were both eaten by the inhabitants of the Marquesas Isles, leaves no doubt of the persistence of certain practices which have almost become hereditary instincts. We still remember with horror the cannibalism which only a few years ago was revealed to us by our tribunals in Algeria.

that it is not so absolutely contrary to human nature as it appears? However painful this avowal may be, it must be confessed, in face of the proofs furnished by palæontology, that the horrible custom alluded to by Voltaire was formerly, and still remains, more widely spread than he believed. We read in the *Journal des Savants* (August 1867), in a remarkable paper by M. Saint-Hilaire upon human sacrifice in India, an account of the Khonds settled among the mountains of Orissa, one of the most fertile districts of the peninsula, a people who cultivate the soil and gather in rich harvests, and who yet cut to pieces, as it were with delight, their *meriahs*, and distribute pieces of the flesh among the assembly, and offer to Bera, goddess of the earth, human hecatombs, unequalled except by those of the ancient Mexicans.[1]

'What, then,' exclaims M. Saint-Hilaire—'what are these races where horrors so great and so enduring are possible? What especially are these Khonds, among whom human beings are slaughtered more lightly and in greater numbers than animals in Greek and Roman paganism? Here even the word hecatomb, strictly used, is insufficient; it does not express the whole truth. In pagan antiquity, the hundred oxen were rarely sacrificed; in Orissa several hundreds of human beings are slaughtered at once in several villages united for this single purpose, while on all other occasions they are ever at odds. The Roman people in their holidays put to death, to satisfy the thirst for such bloody spectacles, thousands of gladiators in a single day; occasionally even they offered human sacrifice. Other peoples, indeed most peoples, formerly disgraced themselves by such crimes. The Spanish Inquisition burnt thousands at the stake as late as the eighteenth century. But where shall we find such

[1] The number of human victims sacrificed to the gods amounted annually to more than 20,000 in the single town of Mexico. Human sacrifice appears to have been practised by the mound builders of the Ohio and the Mississippi, with respect to whom there is still so much uncertainty. Wilson tells us that upon one of their altars, covered with spangles of silvered mica, some carbonised human bones were found in sufficient numbers to form together a complete skeleton.

vast sacrifices organised for a purpose so selfish and so absurd? Where, above all, shall we find these crimes committed in cold blood in modern times, and by tribes in contact with our civilisation? Cannibals are more excusable, since they at least can plead the pangs of hunger and the near approach of death, only to be avoided by these bloody repasts. In what grade of humanity must we place the Khonds? who could be ranked below them? Can there be anything more mournful, more unheard of among the surprises which the history of humanity has in store for us? These are problems for the philosophy of history. What is man, considered in this sink of filth and blood?'

Thanks to the energy and courage of Major Campbell and Lieut. Macpherson, the fierce inhabitants of the mountains of Orissa have at length been induced, not without extreme difficulty, to renounce their bloody sacrifices. But the deep root which this custom had taken from long habit, and the strength it had gained from superstition, are proved by the almost naïve complaints which they made to the English ambassadors, and the responsibility which they laid upon the new masters, should the displeasure of the goddess Bera lead her to withdraw from the tribes of Khondistan the protection she had until then accorded them. These complaints show how readily the human conscience is quieted and perverted by the persuasive voices of superstition and ignorance. In presence of these facts, unfortunately but too well authenticated, and of the half-charred bones of women and children found at Chauvaux in Belgium, at Sourdes Arbas, Bruniquel, and elsewhere, of the human bones split in the same way as those of animals, is it unreasonable to admit that the tribes who dwelt in Europe in the stone age were sometimes at least cannibals, and that they sacrificed human victims on the tombs of their chiefs or of their gods?

IV. TRANSFORMATION OF HUMAN SACRIFICE INTO MODERN RELIGIOUS DOGMA.

We must not conclude our remarks upon cannibalism and human sacrifice without mentioning the theories put forward upon this subject at the Prehistoric Congress of Bologna by one of the most famous representatives of modern science. M. Carl Vogt starts, it is true, from the doubtful principle that all religion is the daughter of fear and ignorance, and consists in the adoration of the unknown; this unknown, that is God himself, being nothing but a superlative of which the positive is man. He considers cannibalism and human sacrifice, which is its logical consequence, to be a universal fact, a necessary phase in the development of civilisation; nay, far more, the indication of a comparatively advanced stage in this civilisation.

Cannibalism, he says, unknown to our prehistoric ancestors of the age of the mammoth and reindeer, becomes frequent towards the end of the neolithic period. From that time forward we everywhere find incontestable proofs of it, and also of human sacrifice, then at least as common as it was later among the more civilised nations (Jews, Egyptians, Greeks, Romans, Gauls, &c.), and in our own day among tribes who still remain in a barbarous state. But what were the causes and the purpose of these atrocious customs? Fruit-eating by nature, like the anthropomorphic apes, and even insectivorous like the inferior Quadrumana, man only became omnivorous at a comparatively advanced stage in his development. Still less was he originally cannibal. Hunger, the desire of vengeance, superstition above all, are the real sources of this custom. The cannibal savage imagines that the human body and soul form an inseparable whole after, as well as during, life. Every part of the body of man, and even of animals, has its proper function and special qualities. Thus the heart is the seat of courage and warlike valour. In the eye reside wisdom and perspicacity,[1]

[1] Queen Pomaré, before holding the sceptre, bore the name of *Aimata*, or *Eye-eater*.

as manliness in the reproductive organs, and life in the blood. The flesh of the stag gives agility, that of the bison extraordinary strength. These inherent qualities of certain organs may then pass into the body and mind of him who feeds upon them, who absorbs and incorporates them. Moreover, by devouring the object of his revenge, by eating the enemy killed in the battle-field, the conqueror assimilates completely the body and soul of the conquered.

The right of feeding upon human flesh thus naturally became the privilege of the bravest of the conquerors, of the chief of the tribe. Now, as among savages the gods are merely the highest chiefs, they came gradually and logically to offering the divinity, whatever he may be, all that they believed most proper to win his favour or appease his wrath. Hence arose human sacrifices, the immolation of virgins, slaves, children, prisoners of war; and as the idea of expiation is often allied to that of sacrifice, the chosen victim must be the more perfect; and the more precious, the greater the fault to be expiated.

Little by little the religious idea becomes purer, and from real the sacrifice becomes merely symbolic. Such is, for instance, the Sacrament of the Christians, whose parallel M. Vogt and Prof. Fritz, of Marbourg, find in certain sacrifices in use among the ancient Mexicans at the feast of their god Huitzilipochtli. The words of Jesus himself are, 'He who eats my flesh and drinks my blood lives in me, and I in him.' 'We see,' says M. C. Vogt, 'these words are entirely based upon the idea, which is still in favour among the Jews, that the life is in the blood, and that by absorbing the flesh and blood of any one the life of the person passes into the feeder. We must then absolutely feed upon the flesh and blood of the Son of Man, that his innocence may pass into us, and our sin into him. But this is but one view of the Sacrament.' We leave our readers to judge of these theories; though we doubt whether many will agree with them, especially Catholic theologians.

CHAPTER VIII.

THE PORTRAIT OF QUATERNARY MAN.

We share the opinion of MM. de Quatrefages, Ed. Lartet, &c., that man of the diluvium, of the valleys, or of the ossiferous caves is prehistoric, but not primitive man. In spite of the numerous fancy sketches which have been made of him, primitive man, in the true sense of the words, remains hitherto absolutely unknown to us. As to the carver of the axes of Saint Acheul and the knives of Aurignac, the records concerning him are still unfortunately very incomplete. A few skulls more or less broken and crushed, a few bones more or less perfect, are the only data upon which, in the present state of science, we can found a description worthy of any confidence whatever.

Physical Type.—We are a little better informed with regard to the anatomical character of man of the reindeer and neolithic ages; but many important data are still wanting, and many errors have been committed, even by those who are best informed. Thus it was at first asserted that the dwellers in caves were of short, or, at most, of medium stature; that they were brachycephalous, and that their low and retreating foreheads were furnished with prominent overhanging brows; that their face was markedly prognathous and almost deprived of chin, &c. But it is quite possible that all these characters were individual, mere varieties of an unknown specific type. It appears to be now proved, as we have mentioned before, that the dolichocephalous type preceded the brachycephalous, or at least predominated at first—if, however, it is allowable or prudent to draw conclusions from such insufficient

data. For the rest, the skull of the Olmo may be advantageously compared with those of Eguisheim and Neanderthal, with which it is nearly contemporary. 'It is a fine skull,' says Vogt himself. Still finer were the skulls of the reindeer hunters of Périgord (fig. 148), who were of great height, athletic, with a strongly-built skeleton, with pillared femurs, platycnemic tibias, channelled fibulas (fig. 145, 146, 147) and humerus, of which the olecranian cavity is often perforated; anatomical peculiarities

FIGS. 145, 146, 147.—C. Flattened tibia of an old man of Cro-Magnon
D. Femur of the same, seen in profile. E. Fibula of the same.

which recur both before and after the reindeer age, until towards the end of the neolithic period, and even in our own days. With regard to the colour of the hair, while Haeckel says it was black and woolly, M. de Quatrefages believes he has good reason for thinking it was red, and that the skin, instead of being black or brown, as the German author supposes, was very similar in colour to that of the present Mongol races. But how is it possible, in the absence of the hair and skin, to judge of the shade of complexion, so

variable, moreover, in one and the same race? The Hindu women, who undoubtedly belong to the so-called white race, are brown-skinned. How can we tell, having never seen them, that the transverse section of the hairs of so-called primitive man was round or elliptical, their colour red or black?

Manners and Customs.—The above details prove that European man formerly, and for a considerable period,

FIG. 148.—Skull of an old man of Cro-Magnon.

dwelt in caves, or even in mere sheltered places among the rocks, such as la Madelaine, Bruniquel, and Cro-Magnon. This was his miserable home; here he took his meals, and allowed the remains of his food, uninviting to our fastidious palates, to collect. The flesh of the mammoth, of the great cave bear, of the amphibious rhinoceros, of the horse, the aurochs, the reindeer, the fox, and, doubtless, also wild fruits and roots, formed his staple diet. Usually the flesh of the animals was eaten raw; but fire had long been known, and even pottery had been invented, and was

used for culinary purposes. Hunting was his principal occupation. Armed with the stone axe, or mace, with the flint-headed lance, javelin, or arrow, he boldly attacked the animals, often of colossal size, which then peopled our lands, and of which many have long since disappeared. He clothed himself in their skins, which he had early learnt to smooth with the scraper, to soften and prepare with fat or marrow, and later by means of a stone polisher. During the reindeer age the booty obtained by fishing with a barbed harpoon (for the net was not then invented) added its contingent to his daily food. The shooting of birds was likewise no longer neglected. The bones and teeth of the reindeer and of contemporary animals were used in the manufacture of weapons and tools of every kind, and even articles of luxury and ornament. The arts of design were born; and the reindeer hunters of Périgord and the bear hunters of the Pyrenees employed their leisure hours, now become less rare, in carving their weapons, and in drawing or engraving on wood, bone, and ivory the figures of the animals they had before their eyes, and even their own image.

However, the horrors of war already raged among them; might oppressed right and crushed the weak. We see the proof in the serious wounds observed upon the weapons of the Danish warriors of the age of stone, and, perhaps, even upon the skulls of defenceless women. (Skull of Cro-Magnon.)

We gather from several indications that in certain cases, at least, they practised cannibalism. Some authors maintain that this custom, and that of human sacrifice, were widely spread among the troglodytes of the stone age. Others, on the contrary, endeavour to absolve our ancestors from the crime of which the proofs appear to us in many cases overwhelming.

The bone needle was invented, and the curious specimens found in the caves of Dordogne, of England, and of Belgium, prove that, from this remote epoch, the women, and probably the men also, knew how to sew the clothing they wore. Tendons split into fine filaments,

bark fibre, and later textile plants furnished the sewing thread.

All these customs, cannibalism and human sacrifice excepted, resemble those of the Eskimos, of the Greenlanders, and especially of the Siberian Tshouktschis, who, hardly a century ago, still dwelt in caves, whose entrance they closed with reindeer skins, ignoring the use of metals, and employing sharp stones, bone fish-hooks, pikes armed with pointed bones, and utensils of wood or leather.[1] The women used the split tendons of quadrupeds and needles of fish-bone to sew their clothing of skins. We have seen that the troglodytes of Périgord employed delicate perforated bone needles for the same purpose. The family and the society were also organised among the latter, even in the reindeer age. If we accept the explanation given by Edward Lartet, of the ornamented and perforated instruments which he calls wands of office, and if we consider with him that the number of holes indicates the various degrees of authority, there were already chiefs and subjects.

After having sheltered the living, the caves became the last resting-place of the dead. With them were buried the weapons, the ornaments, the articles of every kind which they had used during their life on earth, and which they were to employ in that other life of which even the dweller in the caves seems to have had a vague presentiment. For the rest, he had a barely rudimentary notion of the divinity, a rude fetichism, some absurd superstitions; but no religion worthy of the name, no idiom, of which any remains, however mutilated, have come down to us.

With regard to the troglodytes who, during the age of polished stone, dwelt in the Pyrenean caves of Ariège, they undoubtedly had attained to a degree of civilisation far more advanced than that at which the inhabitants of the caves, of the age of the mammoth and reindeer, came to a stand.

[1] See the interesting details upon this subject given by M. L. Lartet in his paper upon *Une Sépulture des Animaux Troglodytes des Pyrénées.*

Their stone tools and weapons are polished with great care, but work in bone had made no great progress; it may even be said to have retrograded, since we no longer find those engraved drawings, those carvings whose comparative perfection is a subject for surprise in the second half of the reindeer age. Pottery exists, but the wheel is not yet invented. Like the inhabitants of the Swiss lake dwellings, with whom they were contemporary, the troglodytes of Ariège had domesticated the dog, the pig, the ox, the goat, and the sheep. These ruminants not only furnished them with meat, but also an abundance of milk, and probably also butter and milk.

A favourite food was the *Helix nemoralis*, of which the shells are found in heaps at Niaux, Bedeillac, and elsewhere. Shooting with the bow and arrow procured them abundance of game (the wild goat and blackcock); nuts, sloes, and wild cherries were part of their diet, with strawberries, raspberries, and chestnuts. They drank nothing but pure spring water from cups of ox or aurochs horn, or the hollow antlers of the stag.

Like their predecessors of the epoch of the bear and reindeer, they clothed themselves in the skins of animals killed in the chase, or kept in a domestic condition. Weights for stretching the weaver's loom, and spindles found at Ussat and at Niaux, seem to show that the arts of weaving and spinning were not unknown to them. In brief, their simple customs offer a close resemblance to those of the earliest lake dwellers.

No cereals or wheaten bread have been found among them. Nevertheless, MM. Garrigou and Filhol are inclined to think that they knew something of agriculture, since they have discovered millstones of granite, syenite, and other hard rocks; but they had nothing but stone hoes or picks of stag's horn for ploughing the soil. MM. Garrigou and Filhol avow complete ignorance with regard to the burial rites and religious ceremonies of the prehistoric tribes of the Tarascon valley.

The man who has left incontestable traces of his existence in the most ancient quaternary beds (and *à*

fortiori in those of the reindeer age), although inferior in many respects to the man of our own day, nevertheless resembled him in all essential points. In spite of his savage manners, and the barbarity of some of his customs (cannibalism and human sacrifice), he was *man* in all senses of the word—anatomically, intellectually, and morally.

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